Cottage, Lodge, and Villa Architecture.

by

W. & G. Audsley.

William Mackenzie.

London.   Glasgow.   Edinburgh.

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It is unquestionably to the revival of our national styles that we must attribute the great progress which has been made in our day in all branches of architecture and architectural art. It has restored to us those styles whose flexible nature renders them equally valuable for the rich and the poor: for whilst the lordly Palladian could not shrink to the humble proportions of a cottage, and the Greek appeared both out of place and ridiculous in anything of less pretensions than the temple-like hall or church, the Gothic and Elizabethan styles rejoiced alike in their innate beauty and fitness whether exhibited in the labourer's cottage, the elegant villa, or the mansion of the nobleman.

Pugin, who was the first to vindicate successfully the claims of our national styles of architecture, and who did so much personally as well as by his writings towards their reintroduction, says, alluding to the ancient mansions of England:—"They were substantial, appropriate edifices, suited by their scale and arrangement for the purposes of habitation. Each part of these buildings indicated its particular distinction: the turreted gatehouse and porter's lodging, the entrance-porch, the high-crested roof, and louvred hall, with its capacious chimney, the great chambers, the vast kitchens and offices, all forming distinct and beautiful features, not masked or concealed under one monotonous front, but by their variety in form and outline increasing the effect of the building."

Of all our national styles, those grouped under the general head of the Gothic are beyond all doubt the ones which are best suited to our present requirements, being most accommodating and tractable in the hands of the architect. In short, there are no other styles which are equally suitable for the cathedral and the little village church, the palace and the cottage, and which display peculiar beauties and perfect fitness under all conditions.

Gothic architecture gives the greatest possible freedom to the artist and the planner, neither interfering with the latter in the details of internal arrangement, nor with the former in matters appertaining to taste and imagination. When the planner places his various apartments in their proper positions in any building, great or small, the style offers him every encouragement in doing so; and, on the other hand, when the artist designs his exterior, whether devoid of ornament or teeming with it, the style, ever accommodating, readily supplies all the materials he requires. Relative to this subject, Mr. Ruskin remarks:—"The variety of the Gothic schools is the more healthy and beautiful, because in many cases it is entirely unstudied, and results not from mere love of

change, but from practical necessities. For in the one point of view Gothic is not only the best, but the only rational architecture, as being that which can fit itself most easily to all services, vulgar or noble. Undefined in the slope of its roof, height of shaft, breadth of arch, or disposition of ground plan, it can shrink into a turret, expand into a hall, coil into a staircase, or spring into a spire with undegraded grace and unexhausted energy; and whenever it finds occasion for change in form or purpose, it submits to it without the slightest sense of loss, either in its unity or majesty—subtle and flexible as a fiery serpent, but ever attentive to the voice of the charmer. And it is one of the chief virtues of the Gothic builders, that they never suffered ideas of outside symmetries and consistencies to interfere with the real use and value of what they did. If they wanted a window, they opened one; a room, they added one; a buttress, they built one—utterly regardless of any established conventionalities of external appearance; knowing, as indeed it always happened, that such daring interruptions of the formal plan would rather give additional interest to its symmetry than injure it."

Although we are fully impressed with the many beauties and advantages of the Gothic styles of architecture as applied to domestic work, advantages which assert themselves over those presented by all other styles, we do not by any means desire it to be understood that we undervalue the rival styles now generally practised in England. Each school has its beauties and advantages, as it has its admirers; and although it is much to be desired that one school should be adopted, there can be no serious objection in our day to the free use of what the world of architecture presents to us, provided we do not sacrifice utility and comfort for mere whim and caprice, much less fashion. And we have ever held this in view while preparing the Plates of the present work, which we have endeavoured to make as generally useful as possible, not only by the variety of their designs, but also by the absence of extravagance in their treatment.

We have previously remarked that it is to be desired that one style of architecture should be adopted by us in the present day; but we cannot hope to see that desirable end attained, so long as individual taste and fancy are allowed to rule in matters of architecture. What might appear to be the greatest difficulty in attaining "a consummation devoutly to be wished," namely, that of getting a style which is at once available for all the multitudinous purposes of modern times, is in reality no difficulty at all. Every one, who has given any attention to the subject, knows that the mediæval or Gothic styles fulfil all that is required to fit them for present adoption, and that there

are no others amongst those which we at present use which are equally suitable, if suitable at all, for the very many classes of buildings which are being every day erected in our towns and rural districts. Even the Elizabethan, which is one of our own styles and closely allied to the latest period of the Gothic, cannot be said to be much more flexible than those styles which are not of northern birth, and which we have had little cause to introduce. For domestic architecture, the Elizabethan is quite as suitable as the Gothic, even if we view it in its many phases, from the half-timbered cottage or farm-house to the palatial piles of Wollaton Hall or Burghley, but there its province terminates. The only advantage which Gothic has over the Elizabethan in domestic work is, that it is more beautiful. Everything that can be done in Elizabethan can be executed in Gothic with far more grace, beauty, and truth. This, however, will not be readily granted on all hands at the present hour, while so many are groping about amongst the ruins of past architectures, endeavouring to find in the temple styles of Egypt, Greece, and Rome, that which their own northern lands present to them ready-fashioned for their wants.

Several objections to the reintroduction of Gothic architecture have been started by those who have not been able to shake themselves free of their old prejudices, amongst which are the following:—That the desire to revive mediæval architecture is an attempt to reintroduce mediæval tastes and customs; and to bring back to us the imperfections as well as the perfections of the old modes of building; that the Gothic revivalist believes in "dark rooms and passages," "rough walls," "useless gables," "absurd carving," "expensive tracery work" which renders the windows small and almost useless, "ugly woodwork," and "uncomfortable furniture,"—and what is almost worse, that he does not believe in plate glass, cast iron, cement fronts, paint, veneer, and such like, all charming materials in the hands of the modern builder.

Now, we may safely affirm that such is not the case. The true Gothic revivalist does not desire to see, by a servile copyism of ancient buildings, the comforts and indispensable requirements of modern civilization done away with or even modified, but rather desires to elevate his art by making it subservient to every end, and by moulding it to suit the every day wants of his time. Neither does he believe in dark rooms and passages, nor small windows, for no style of architecture gives him greater facilities for lighting his buildings. Mr. George Gilbert Scott's remarks on this topic are so worthy of being quoted that we cannot refrain from giving them:—

"No feature in domestic architecture requires more consideration than the *window*. To

give the requisite amount of light, without unduly cutting up the wall; to admit air when you want it, without admitting wind and wet, which you do not want; to have free scope for viewing external objects, without needlessly exposing your rooms from the exterior; and to do all this in such a way as will add beauty and character to your building, both within and without, are important objects to be aimed at in any style.

"It has been very much the fashion to assert that a Gothic house must be defective in these particulars; indeed, our assailants have made this one of their strong points, and have put together a string of terms, such as 'dark rooms,' 'dark monkish buildings,' 'dark passages,' &c., &c., which they use whenever the subject is alluded to: and so much are people who do not look into things for themselves misled by these stock terms, that one frequently hears persons, not otherwise unfavourable to Gothic architecture, coolly say that they think, in a country like ours, where light is scarce, the *Italian* style is preferable as affording greater facilities for its admission! Under what an extraordinary delusion these persons must suppose the originators of both these styles to have acted! We generally imagine the characteristics of different styles of architecture to have arisen in a great degree from local necessities, and, among other causes, from difference of climate: here, however, it would appear that the Northern architects, being especially in need of *light*, originated a style whose great characteristic is its exclusion, an error happily compensated for by the architects of Italy, who, dealing with a superabundance of light, and a burning sun, which they would naturally desire to exclude, fell, luckily for us, into the parallel blunder of contriving a style eminently suited to the free admission of both; so that we have nothing now to do but simply to make a mutual exchange of styles, and both will be suited to a nicety!

"The truth, however, is, that no such blunder ever was made, excepting in the fertile imagination of our opponents. Gothic architecture, as might be expected from its northern origin, is *par eminence* a *window* style; so much so, that by its windows we most readily distinguish it from other styles, and by them we define its different historical changes.

"In the pure Greek the window comes in only as a thing to be ashamed of, and the means of lighting the finest Greek temples are still a mystery. In Roman buildings it assumes a more definite position, but still seems rather admitted as a necessary intruder than a legitimate part of the architecture. It is in the works of the middle ages that the window first takes its proper position, as one of the most essential architectural

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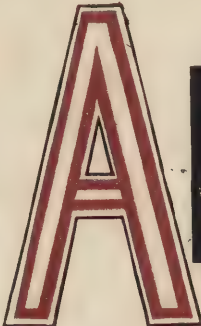# Cottage, Lodge, and Villa Architecture.

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CONTENTS.

INTRODUCTORY ESSAY.

THE rapid advance which has been made during the last few years in all departments of Architecture, will form a leading feature in the Art History of the Nineteenth Century. This progress has not been confined to the higher branches, but has been equally displayed in the utilitarian.

The acquisition of a purer taste in architectural design, and the revival of the ancient decorative and ornamental arts, have been attended by numerous inventions and adaptations, the aim and tendency of which are to promote the welfare and comfort of mankind.

The great progress that has been made, during the last thirty years, in the development of domestic architecture in this country, has wrought a marked change both on the external appearance and internal arrangement of our dwelling-houses; and there is little doubt but that greater improvements will still be made, as the nation grows in taste, refinement, and wealth.

It would be both interesting and profitable for us to go back two centuries or so, and review the state of domestic architecture as it existed shortly after the introduction of the Palladian style, following it through its many changes up to the present time; but such a lengthy review would be somewhat out of place in the pages of a purely practical work like the present. We may here briefly remark, however, that at the close of the last century the Palladian style of architecture, as introduced by Inigo Jones, had become changed, after numerous essays at uncomfortable grandeur, to something approaching completeness as regards domestic requirements, and presented a few indications of common sense in the desire to be useful. It was, however, still very imperfect, and left much to be done by the architects of the present century.

The introduction into this country of the ancient classic styles, which took place about fifty years ago, was anything but a step in the right direction. This was speedily discovered; and, notwithstanding great opposition on the part of the majority of our architects, who, in the face of the numerous striking and severe lessons they were every day

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"In the pure Greek the window comes in only as a thing to be ashamed of, and the means of lighting the finest Greek temples are still a mystery. In Roman buildings it assumes a more definite position, but still seems rather admitted as a necessary intruder than a legitimate part of the architecture. It is in the works of the middle ages that the window first takes its proper position, as one of the most essential architectural

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features, and as the most important vehicle for architectural decoration. It may be that the Italian architects of the Renaissance succeeded in remedying in a great degree this defect in the ancient styles, but it was the example of the mediæval architects which enabled them to do so.

"Even now the window is felt to be an intruder in purely classic architecture; so much so, that in the most magnificent of its recent productions—St. George's Hall, at Liverpool—every effort has been used (at least on the show side) to conceal the means by which the light is admitted, as if the "offspring of heaven first-born" were one of those meaner necessities of our nature which we reluctantly admit, instead of hailing with love."

As Mr. Scott has alluded to St. George's Hall, we may be pardoned if we say a few words as an appendix to his remarks. For nearly all the useful purposes for which the Hall was erected it is almost unfitted, so much has been sacrificed for the sake of external appearance and classic propriety. The great hall is dismal during the daytime; its windows, which are on one side only, being half screened by a range of massive columns which do their best to hide them from view on the exterior, and prevent the light from gaining access to the interior. The courts are about as gloomy as the hall, and, in addition, are close and bad acoustically. The corridors have to be lighted by gas during the day as well as at night, and altogether the interior is dull and oppressive in the extreme. How different are the new Law Courts at Manchester, which are built in the Gothic style. These buildings are beautiful architecturally, and in every way suited to their purpose. The interior is perfectly lighted throughout, by windows which are used as ornamental features, not things to be ashamed of. The hall is well lighted, and the courts and corridors are places one would really delight to live in. The courts are perhaps at the present time the finest in England. These buildings most satisfactorily prove that Gothic architecture is, *par excellence*, the style for large public buildings that are intended to be useful as well as ornamental.

As we mentioned above, it is urged as a reproach that the Gothic revivalist delights in "rough walls," "useless gables," "absurd carving," "expensive tracery work," &c. It is true he does prefer a rough wall if it is honest, a truthful wall, so to speak, and detests a smooth one if it is plastered over to look like fine stone; just as an honest man would despise a finished hypocrite. He says, Build a wall of polished marble if you can; if not, build it as good as you can afford, only leave it as it is to tell its own simple tale. The

Gothic architect does not delight in "useless gables," simply because he holds that his gables are not useless. The gable is the creation of the roof, and in nine cases out of ten necessarily attends it, forming at once its most beautiful and convenient termination. What the Classic and the Gothic architects principally differ about is the pitch or height of the roof; for they both admit the gable, although the former chooses to call his a pediment, which, in most instances, is not a true gable at all, but merely a sham stuck on, a piece of built ornament demanded by the canons of his style.

The pediment, or impediment as it should be termed, is different in all respects from the true gable of Northern architecture; for while the latter is merely a continuation of the wall upward to form a termination to the roof, the former is built in advance of the wall, and therefore has to be supported by what is equal to another wall, a row of columns as useless as itself.

The high pitched gable is only a proper and sufficient termination horizontally to the high roof—a peculiar feature in the Gothic and other Northern styles of architecture; and one which was adopted because the nature of the climate demanded its use.

Speaking of Gothic roofs, Mr. Ruskin says:—"Although there may be many advisable or necessary forms for the lower roof or ceiling, there is, in cold countries exposed to rain and snow, only one advisable form for the roof-mask, and that is the gable, for this alone will throw off both rain and snow from all parts of its surface as speedily as possible. Snow can lodge on the top of a dome, not on the ridge of a gable. And thus, as far as roofing is concerned, the gable is a far more essential feature of Northern architecture than the pointed vault, for the one is a thorough necessity, the other often a graceful conventionality; the gable occurs in the timber roof of every dwelling-house and every cottage, but not the vault; and the gable, built on a polygonal or circular plan, is the origin of the turret and spire."

The term "absurd carving" has been used by those worthies who can see no beauty in architectural carved work beyond the Corinthian capital, or the honey-suckle and egg and dart ornaments; and who are so decided in their tastes as to be content to go on repeating them as long as money can be found to pay for them. Like the old Gothic builders, the true Mediævalist detests meaningless repetition. He loves change, and gratifies that love wherever he can, and in nothing perhaps more so than in his carvings. In them he asks, not for fifty feet of this, or twenty capitals of that pattern, but for variety, dictated by an artistic mind and lively fancy. Each capital, to be in accordance with his

ideas, must be a work of art fresh from the mind, as well as the hand, of the sculptor; and each must be able to tell its own tale unaided.

No writer has treated this subject more beautifully and forcibly than Mr. Ruskin, and no one can well allude to it without being tempted to quote his exquisite passages. We are quite unable to resist the temptation, and we are sure our readers will thank us for leaving out our own imperfect remarks for those which are so perfect:—

"Our architects gravely inform us that, as there are four rules of arithmetic, there are five orders of architecture; we, in our simplicity, think that this sounds consistent, and believe them. They inform us also that there is one proper form for Corinthian capitals, another for Doric, and another for Ionic. We, considering that there is also a proper form for the letters A, B, and C, think that this also sounds consistent, and accept the proposition. Understanding, therefore, that one form of the said capitals is proper, and no other, and having a conscientious horror of all impropriety, we allow the architect to provide us with the said capitals, of the proper form, in such and such a quantity, and in all other points to take care that the legal forms are observed; which having done, we rest in forced confidence that we are well housed.

"But our higher instincts are not deceived. We take no pleasure in the building provided for us, resembling that which we take in a new book or a new picture. We may be proud of its size, complacent in its correctness, and happy in its convenience. We may take the same pleasure in its symmetry and workmanship as in a well-ordered room, or a skilful piece of manufacture. And this we suppose to be all the pleasure that architecture was ever intended to give us. The idea of reading a building as we would read Milton or Dante, and getting the same kind of delight out of the stones as out of the stanzas, never enters our minds for a moment. And for good reason;—There is indeed rhythm in the verses, quite as strict as the symmetries or rhythm of the architecture, and a thousand times more beautiful, but there is something else than rhythm. The verses were neither made to order, nor to match, as the capitals were; and we have therefore a kind of pleasure in them other than a sense of propriety. But it requires a strong effort of common sense to shake ourselves quit of all that we have been taught for the last two centuries, and wake to the reception of a truth just as simple and certain as it is new: that great art, whether expressing itself in words, colours, or stones, does *not* say the same thing over and over again; that the merit of architectural, as of every other art, consists in its saying new and different things; that to repeat itself is no more a characteristic of

genius in marble than it is of genius in print; and that we may, without offending any laws of good taste, require of an architect, as we do of a novelist, that he should be not only correct, but entertaining.

"Yet all this is true, and self-evident; only hidden from us, as many other self-evident things are, by false teaching. Nothing is a great work of art, for the production of which either rules or models can be given. Exactly so far as architecture works on known rules, and from given models, it is not an art, but a manufacture; and it is, of the two procedures, rather less rational (because more easy) to copy capitals or mouldings from Phidias, and call ourselves architects, than to copy heads and hands from Titian, and call ourselves painters.

"Let us then understand at once, that change and variety is as much a necessity to the human heart and brain in buildings as in books; that there is no merit, though there is some occasional use in monotony; and that we must no more expect to derive either pleasure or profit from an architecture whose ornaments are of one pattern, and whose pillars are of one proportion, than we should out of a universe in which the clouds were all of one shape, and the trees of one size.

"And this we confess in deeds, though not in words. All the pleasure which the people of the nineteenth century take in art, is in pictures, sculpture, minor objects of virtù, or mediæval architecture, which we enjoy under the term picturesque: no pleasure is taken anywhere in modern buildings, and we find all men of true feeling delighting to escape out of modern cities into natural scenery: hence, as I shall hereafter show, that peculiar love of landscape which is characteristic of the age. It would be well, if, in all other matters, we were as ready to put up with what we dislike, for the sake of compliance with established law, as we are in architecture.

"How so debased a law ever came to be established, we shall see when we come to describe the Renaissance schools: here we have only to note, as the second most essential element of the Gothic spirit, that it broke through that law wherever it found it in existence; it not only dared, but delighted in, the infringement of every servile principle; and invented a series of forms of which the merit was, not merely that they were new, but that they were *capable of perpetual novelty*. The pointed arch was not merely a bold variation from the round, but it admitted of millions of variations in itself; for the proportions of a pointed arch are changeable to infinity, while a circular arch is always the same. The grouped shaft was not merely a bold variation from the single

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one, but it admitted of millions of variations in its grouping, and in the proportions resultant from its grouping.   The introduction of tracery was not only a startling change in the treatment of window lights, but admitted endless changes in the interlacement of the tracery bars themselves.   So that, while in all living Christian architecture the love of variety exists, the Gothic schools exhibited that love in culminating energy; and their influence, wherever it extended itself, may be sooner and farther traced by this character than by any other; the tendency to the adoption of Gothic types being always first shown by greater irregularity and richer variation in the forms of the architecture it was about to supersede, long before the appearance of the pointed arch or of any other recognizable *outward* sign of the Gothic mind.

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"I must now refer for a moment, before we quit the consideration of this, the second mental element of Gothic, to the opening of the third chapter of the 'Seven Lamps of Architecture,' in which the distinction was drawn between man gathering and man governing; between his acceptance of the sources of delight from nature, and his development of authoritative or imaginative power in their arrangement: for the two mental elements, not only of Gothic, but of all good architecture, which we have just been examining, belong to it, and are admirable in it, chiefly as it is, more than any other object of art, the work of man, and the expression of the average power of man. A picture or poem is often little more than a feeble utterance of man's admiration of something out of himself; but architecture approaches more to a creation of his own, born of his necessities, and expressive of his nature.   It is also, in some sort, the work of the whole race, while the picture or statue are the work of one only, in most cases more highly gifted than his fellows.   And therefore we may expect that the first two elements of good architecture should be expressive of some great truths commonly belonging to the whole race, and necessary to be understood or felt by them in all their work that they do under the sun.   And observe what they are: the confession of Imperfection, and the confession of Desire of Change.   The building of the bird and the bee needs not express anything like this.   It is perfect and unchanging.   But just because we are something better than birds or bees, our buildings must confess that we have not reached the perfection we can imagine, and cannot rest in the condition we have attained.   If we pretend to have reached either perfection or satisfaction, we have degraded ourselves and our work.   God's work only may express that; but ours may

never have that sentence written upon it,—'And, behold, it was very good.' And, observe again, it is not merely as it renders the edifice a book of various knowledge, or a mine of precious thought, that variety is essential to its nobleness. The vital principle is not the love of *Knowledge*, but the love of *Change*. It is that strange *disquietude* of the Gothic spirit that is its greatness; that restlessness of the dreaming mind, that wanders hither and thither among the niches, and flickers feverishly around the pinnacles, and frets and fades in labyrinthine knots and shadows along wall and roof, and yet is not satisfied, nor shall be satisfied. The Greek could stay in his triglyph furrow, and be at peace; but the work of the Gothic heart is fretwork still, and it can neither rest in, nor from, its labour, but must pass on, sleeplessly, until its love of change shall be pacified for ever in the change that must come alike on them that wake and them that sleep."

It would, indeed, be presumption on our part to add to the beautiful words of Mr. Ruskin; and we feel assured that they are not required. Our readers will agree that he has fully vindicated the rich and changeful nature of Gothic carving from any such term as "absurd."

The objection to Gothic architecture because it demands the adoption of "expensive tracery work, which renders the windows small and almost useless," is, to say the least of it, ridiculous; and has arisen from total ignorance on the part of those who used it. Gothic architecture, after all that has been said for and against it, is simply an architecture of common sense, governed by the love for the beautiful and the true: and in this respect perhaps it stands alone. It does not compel anything to be adopted which is not both useful and expedient, much less the article in question, tracery. Tracery has now come to be looked upon as so far unnecessary as to be called the "last resort of the destitute," and when one sees a new building loaded with "expensive tracery," one may safely pronounce its architect to be more cramped in knowledge than funds. In domestic architecture, windows filled with tracery are objectionable, as affecting not only light but comfort and convenience. And it must be said that when an architect introduces them into dwellings which are not purely or principally ornamental, the architect is to blame, not the style he has used.

The principal objections to the use of tracery in the windows of domestic dwellings, are, that it cuts up the window space into too many divisions, a great proportion of which must be small and almost useless: that it renders the use of moveable sashes altogether impossible, or at least attended with great inconvenience and expense, unless

the difficulty be overcome, as it sometimes is, by sham tracery being stuck in front of ordinary sashes, an expedient which we trust no architect nowadays will find himself either inclined or compelled to adopt: that, for its proper display, it demands windows with large arched heads, and with these the desirable square finishings cannot, with good effect, be used in the interior of the rooms. Arched windows of any size and importance, filled with tracery, which retain their arched form on the inside, cannot well be introduced for rooms under fifteen feet in height. But as we shall speak fully on this subject later on, it is unnecessary to go into particulars now.

The adoption of the early Gothic styles gives the greatest freedom to the architect, and liberty to either use or omit tracery in his windows, and to introduce the pointed arch or the straight lintel over all openings, as he feels inclined or as circumstances demand; or he may adopt the pointed arch as an external feature, and convert all door and window openings to the most convenient shape by the insertion of tympani. Examples of this treatment may be found in our designs for Gothic houses. The tympanum can be made a very beautiful feature if suitably enriched with mouldings, panelling, or carving. The tympanum has always been a favourite spot for sculpture. Although figure sculpture has been very sparingly used in connection with our domestic architecture, there is no reason why it should not be introduced in our dwellings. Its adoption is much to be desired, and would tend greatly to the advance of art. It is necessary to observe that an appropriate use must be made of it, and that it should in all cases be either an illustrator or teacher.

The Gothic architect is charged with a love for "ugly woodwork" and a strong affection for "uncomfortable furniture." Now this appears true to those who have not mastered the real principles of artistic woodwork, and who put their trust in smooth and veneered prettiness, notwithstanding all the sham and falsity it displays, or admire wood, not for its own peculiarities and properties, or in its own province, but because it is a useful and cheap material, with the addition of a few coats of paint and perhaps a little sand, for the imitation of marble or stonework. For the *imitation!* He who uses wood to *imitate* anything is a critic whom the Gothic artist can well afford to laugh at, and even be thankful to be condemned by.

Much less, however, is said against Gothic woodwork now than was said a few years ago, simply because it is being every day better understood and appreciated; and what appeared at first to be ugly is found, after all, to have a beauty peculiar to itself.

True Gothic woodwork, apart from its artistic treatment, which is in most cases of a high order, is really beautiful in its simplicity, its honesty, its constructional excellence and durability, and its fitness for all the purposes for which it is employed.

We may pardon those whose education has taught them to believe in glue, stuck-mouldings, graining, and veneer, for condemning Gothic woodwork or even for calling it ugly. Truth to them, as a principle of art, has ever been unknown, or, what is as bad, unacknowledged; and a simple chamfered style and plain panel in pine or unpolished oak is decidedly an ugly thing, and not to be compared with the carefully finished, stuck-moulded, and veneered or grained piece of workmanship, which is so fashionable. They believe that there is nothing to say against their favourite work from an artistic point of view, for what could look better than a grained door in perfect imitation of some costly wood, or a beautifully veneered piece of furniture with rich mouldings covered with the precious film, all looking as if it was of solid wood? but they are compelled to admit that the stuck-mouldings will not always stick, and that veneer is very much given to starting, cracking, and peeling off. All such work may do very well for a short time, but, like everything that is false, it cannot stand the test of all good and true work, *time:* and its decay places it immeasurably beneath the humblest, which has only its simple truth and honesty to recommend it, but which will recommend it to the end.

It appears to us that mediæval woodwork is considered ugly, because its construction generally is of the strongest and simplest description and by no means disguised, and because elaborate carving is not used. The absence of carving, which is used so largely in other styles of woodwork and especially in fashionable furniture, certainly gives an air of simplicity and severity which is not discovered to be beauty by the majority of minds. In oak-work the absence of polish and high finish by sand-paper, &c., and in ordinary work in deal the absence of graining, that never-failing resource of the ignorant house-painter, tend to give a common appearance to Gothic work which is misunderstood by general observers, to whom honesty appears necessary in man, but not even desirable in his handiwork.

The outcry against mediæval furniture has been caused by the introduction, by our cabinet-makers, of a class of furniture termed Gothic, but which is very far from being so; and which has been constructed in total ignorance of the first principles of Gothic art and at variance with all sound ideas of taste. People, however, are beginning to learn that chairs should not be made in imitation of church fronts, with pinnacles, crockets,

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finials, flying-buttresses, and the like; and that there is no necessity that their backs should be pierced in the exact likeness of some west window of a cathedral; and that straight backs are not demanded in a Gothic chair more than in a modern French one.

This absurd class of furniture is rapidly dying out and giving place to that which is at once more correct and beautiful, and which, being designed to be useful, escapes the accusation of being uncomfortable. We shall speak more particularly on this subject when we come to treat of woodwork.

And now we must turn our attention to those things which the mediævalist of the present day is blamed for not approving of. These, as enumerated before, are plate glass, cast-iron, cement, paint and veneer.

In speaking of the use of plate glass in Gothic work, it is necessary for us, in the first place, to remark that there are two classes of mediæval architects;—those who are anxious to make their art of real value in the present day, by availing themselves of all the improved manufactures and appliances, and by moulding it to suit the requirements of the time; and those who are so imbued with antiquarian tastes and lore as to desire to retain as far as possible the peculiarities of ancient work. The latter class, which is by far the smaller, is composed of men of great ability, and it is to be regretted that they do not more fully realize their position as men of the nineteenth century, and what is expected of them as followers of a great and useful art.

Glass is one of the materials upon which Gothic architects differ: for while the generality of them approve of plate for many reasons, the others reject it on all occasions, and adopt leaded glass. There is no question but leaded glass is more artistic and in many cases more suitable in Gothic work, but it is by no means indispensable; and the architect who really desires to see Gothic architecture come into general favour, will unhesitatingly use plate glass where it is required or even most expedient, and leaded glass where artistic effect is the all-important consideration, or where there happens to be no objection to it.

As to cast-iron, there can be no reason for its rejection by the mediævalist, although the antiquarian may urge that its use is not encouraged by precedent: but it must be used properly, and in its own peculiar province, or not at all. Cast-iron Gothic work is a term which seldom fails to convey an idea of everything that is absurd, hideous, or false: at one time it is in imitation of stonework, with details borrowed directly from stone carvings, mouldings, &c.: at another time it attempts to imitate

wrought-iron. In the former instance it is simply an abomination, but in the latter it is worse, because it attempts to mislead the observer: it is principally on this account that the mediævalist dislikes cast-iron. It is as unnecessary, however, for it to assume one character or the other, as it is for it to be totally rejected. Cast-iron is right and useful in its sphere, but highly objectionable when wrongly applied and out of its place.

The practice of coating over the exterior of our buildings with cement, has proved almost fatal to the architectural appearance of our towns, and cannot be too strongly condemned by every lover of art: for, as long as it is encouraged, it is useless to hope to witness any great improvement in our architecture. There is nothing more objectionable to the true Gothic architect than this practice, which he places at the head of the only too numerous deceits and shams which have of late years crept into favour in the building world.

That the Gothic architect should be condemned for not approving of cement fronts is not to be wondered at, when he openly declares that he would sooner have the roughest wall a mason or bricklayer could build, as long as it professes to be no better than it really is. This idea seems absurd to our modern house-builders, and is laid down by them to affectation and eccentricity.

The mediævalist holds very decided views with regard to paint,—not by any means rejecting it, but restricting its use within proper bounds. When used for imitative purposes, and not for its own value as a useful and ornamental material, he thoroughly detests it in all shapes: the most cunning and elaborate piece of graining, marbling, or graniting failing to charm, as it fails to deceive him.

It is truly astonishing to observe what deep root this class of decoration (if it deserves the name, here only used for distinctness) has taken in the public mind, planted and fostered by our house painters, or daubers as the generality of them should be called. Ask ten out of every dozen painters to inspect a dwelling-house and give their suggestions as to its decoration; and one will hear them all propose with the greatest seriousness to marble this and grain that; and perhaps half of them, more skilful and venturesome than the rest, may think that, although satin wood and maple are very chaste, perhaps the drawing-room might be white and gold, with a neat French paper to match—the last phrase is a great favourite with them:—the most experienced will probably recommend that the dining-room should be grained dark oak all through, ceiling included; the walls divided into imitation panels; and the ceiling made (if expense is

not an obstacle) to represent an ancient oak one, the beams being nicely shaded to look like reality. When the employer is unfortunate enough to have plenty of money, he really cannot be expected to resist this charming picture. The dining-room is done forthwith. Who can realize the excitement of the delighted painter as he hands it over complete—finished! in every sense of the word—resplendent in three coats of the best copal varnish?

That we have had a good deal too much of this apology for decoration, this parody upon art, no one with any degree of taste or knowledge will deny: and great praise is due to the Gothic architects and artists of this country, who have been the stanchest opponents of all such work, and who have done so much towards the introduction of a true and beautiful school of painted decoration.

We shall give a few simple directions for the internal decoration of dwelling-houses in the after part of our essay.

Having, as fully as our space permits, indicated the mediæval styles and their supporters; and having proved that the Gothic styles of architecture are not only suitable, but the most suitable, for modern adoption: we shall now say a few words with regard to the other styles which have been adopted, and are at present in use for house-building. We allude to the Elizabethan, Old Scotch, and the Domestic Italian.

Next to the Gothic, the Elizabethan is unquestionably the most important and suitable style for modern houses. There are a great many very fine examples of it at present in existence; indeed, nearly all the ancient mansions and houses spared to us in England are of the period in which the style reached its greatest perfection. We have therefore ample means at our disposal for its study; and although in designs for moderately-sized houses, such as this work contains, considerable liberties will have to be taken with, and modifications made in, the style as presented in the best examples, we clearly cannot do better than carefully examine and note the leading features and peculiarities of our ancient buildings. Such being the case, it may not be out of place for us to give a few particulars regarding them here.

Amongst the many Elizabethan buildings in existence, Burghley House, Northamptonshire, Kirby, in the same county, and Burton Agnes, in Yorkshire, are perhaps the best types and most suitable for supplying material for our short review.

Burghley House, the seat of the marquis of Exeter, appears to have been finished between the years 1585–90. It is one of the finest mansions in England, and a truly

noble specimen of Elizabethan architecture. It remains, externally, in a good state of preservation; but the greater portion of the interior has undergone alteration. The exterior is characterized by boldness, rather than by richness of ornament: indeed, until we reach the roof line, we find nothing (except at the entrances) but richly moulded and mullioned windows, and bold projecting stringcourses and cornice mouldings running between each stage of them. Above the roof line, however, the structure breaks into a splendid group of ornamental features—high pierced parapets, towers, and tall chimneys of peculiar design. The building has massive square towers at all its main angles; and the wall-spaces between them are well relieved by projecting windows, which are in all cases carried up through the three stories. The entrance gateway in the west front is flanked by octagonal turrets of five stories high, finished with ogee roofs. Between these turrets, and supported on a corbel, is a fine oriel window of three stories. The square angle towers are picturesquely finished with short ogee roofed turrets and high arcaded parapets. Parapets of a similar design ornament all the projecting windows and the west front. The walls of the remaining portions of the building carry balustrades, relieved by square angle pinnacles, and pedestals bearing finials.

The north façade of the house has another entrance, consisting of an archway flanked with four single Roman Doric columns, placed on high pedestals, and bearing an entablature with panelled frieze. The pedestals are panelled in the usual Elizabethan fashion. Over this entrance there is a fine semicircular window of two stories, and two quadrant windows join the projecting central feature to the main walls. A more characteristic specimen of the style can scarcely be found, than this central group in the north façade of Burghley. The chimneys are of peculiar design, being formed of Doric columns in groups of two, three, and four, bearing plain entablatures; the smoke passes through the columns, and finds its way out at the top of the entablatures.

In Kirby we find a somewhat different treatment of the style. The high pitched roof and gable, features not to be seen in Burghley House, are here universally employed, and with charming effect. The main gables and dormers of the garden front are shaped in the true Elizabethan manner with scroll-work, and ornamented with pinnacles, ball-finials, &c. The windows are similar to those of the previous example, only in several cases they are very much larger; for instance, those towards the quadrangle have as many as three and four transoms in their height. A strong classic treatment prevails in the quadrangle, but there is little or none of it in the garden front. The large semicircular windows of

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Kirby are very striking features, terminated, as they are, with their fine curved and ornamented gables.   Burton Agnes is a much less elaborate building than either of the preceding examples, but is nevertheless a good specimen of Elizabethan.   It has, like Kirby, the high roof; but its gables are plain in outline, and are terminated with finials in imitation of the Gothic.   The two wings of the entrance front have fine semicircular windows of three stories high, terminated with balustraded parapets.   The windows are richly moulded, and are divided by massive mullions and transoms.   Rich cornice strings to each story go round the building.   The entrance porch or tower is the most ornate part of the structure: it is of three stories high, and terminated on all sides by very rich gablets of scroll-work.   The side in which the doorway is placed has three tiers of columns on panelled pedestals.   The columns of the ground floor are Ionic in character; those of the first floor are Corinthian, and those of the second floor are Composite.   The doorway is very plain, only having a small moulding round it, and a few simple panels over its head.   Between the columns of the upper stories are large panels containing coats of arms, and bearing scroll-work over them.   Another tower of a similar style is placed in this façade, to give uniformity to the general design.

Some portions of the interior of Burton Agnes are very fine and characteristic, such as the great gallery, the main staircase, &c.; but it would be quite impossible to convey any idea of them without illustrations.

It will be observed, by our short description of the salient features of the buildings under review, that although the large many-mullioned window, so universally adopted, and the high roof and gable, show a clear descent from the Gothic style, a very strong feeling for the classic asserts itself in all such objects as columns, parapets, and mouldings.   It is very curious to observe the many novel features which have resulted from this grafting of the imported Italian element on the English mode of building.   A great deal of originality is likewise to be found in Elizabethan work, and many beautiful designs are met with on all hands, when one examines a good specimen of the style.   For instance, the garden porch and the fire-place in the great chamber of Coombe Abbey; the staircase and the fire-place in the gallery of Burton Agnes, &c.   For drawings of these, and many other very beautiful specimens of Elizabethan work, we must refer our readers to Mr. Richardson's valuable book on the Architectural Remains of the Reigns of Elizabeth and James I., and the beautiful pictorial works on the Mansions of England, by Nash and others.

In taking particular notice of the union of the Italian element with the late Gothic of this country, Mr. Fergusson remarks in his description of the two fine Elizabethan mansions, Longleat and Wollaton:—"Longleat, built between the years 1567 and 1579, is one of the largest as well as one of the most beautiful palaces in England of that day. * * * Its front measures 221 feet, its flanks 164, so that it covers about the same ground as the Farnese Palace at Rome, though both in height and in other dimensions it is very much inferior. It consists of three stories, each ornamented with an Order,—each of which tapers gradually from the lowest to the summit in a very pleasing manner, the details throughout being elegant, though not rigidly correct. The most pleasing part of the design is the mode in which the façades are broken by projections—two at each end of the principal façade, and three on each of the lateral faces. This, with the windows being large and mullioned, gives to the whole a cheerful, habitable look, eminently suitable to a country residence of an English nobleman, though these features deprive it of that air of monumental grandeur which the Italian town palaces possess. We meet also in this design a peculiarity which distinguishes almost all English houses from those of Italy or France. It is, that the court—where there is one—is a back court. The entrance is always in the principal external façade, and all the principal windows of the living-rooms look outwards towards the country—never into the court-yard. Generally an English house is a square block, without any court in the centre; and when there are wings, they are kept as subdued, and as much in the back-ground, as possible. The Italian cortile is entirely unknown, and the French basse-court is only occasionally introduced, and then by some nobleman who has resided abroad, and learnt to admire foreign fashions.

"If from Longleat we turn to Wollaton, which was commenced in the year after the other was finished, but by an English architect of the name of Smithson, we find the orders used to about the same extent, and, as far as words could describe them, in about the same manner as at Longleat; but when we compare the two designs, instead of the almost Italian purity of the first, we find a rich Gothic feeling pervading the latter, and running occasionally into excesses bordering on the grotesque. The great hall, which rises out of the centre of the whole, and is plain in outline and Gothic in detail, overpowers the lower part of the design by its mass, and detracts very much from the beauty of the whole; but, with this exception, the lower part of the design is probably the happiest conception of its age in this country; and if repeated with the purity of detail we could now apply to it, would make a singularly pleasing type of the residence

of an English nobleman. The rich mode in which the Orders are now used in Paris, for instance (Woodcut No. 147 *), shows how easily they could be made to accord with such a design as this, without any incongruity; and even Grecian purity of detail would accord perfectly with such an outline and such a use of the Orders. The age and associations attached to such a specimen as this are too apt to lead us into the belief that the incorrectness of the details adds to the picturesqueness of the effect, instead of the fact being exactly the reverse. Till tried, however, it will be difficult to convince people that such is the case; and it may be feared that the attempt would involve too much originality for the present age."

We now come to the Old Scotch, or what is commonly called the Baronial style. Judging it by the latter name, one would be inclined to doubt its suitableness for modern work, and particularly for house-building; but the style is one of great flexibility, and may be used with good effect in small as well as in large buildings.

The numerous remains of the style existing in Scotland are, with a few exceptions, either castles or fortified dwellings, and of course of a very massive and bold type, too much so to admit of being copied by us in this age of peace and cheap building; yet the student who will take the pains to carefully study the principles and peculiarities of the style as presented in these structures, cannot fail to see that they may all be used in domestic work in the present day, and with the happiest results. The few domestic buildings of the period, still preserved in Scotland, are of a very plain and severe character, but present some details of great beauty and interest.

The first thing that strikes the student of architecture in examining an Old Scotch building, is the strong affinity it presents to Early French mediæval work. The general tone of grandeur and severity which is so conspicuous in the French work is present in the Scotch. The picturesque round towers and corbelled turrets with their high conical roofs; the quaint dormer windows; the rich mouldings and corbels; and the boldly relieved beads or rolls in the jambs of windows, doors, &c., which he admired so much in the early buildings in France, are here presented to his gaze. Combined with these he finds many features which he never saw before, but which are as charming and as effective as they are novel. A tendency to Classic forms and details is frequently to be observed, but it may be questioned whether this must not be considered rather as an imperfection than a beauty.

* See "History of the Modern Styles of Architecture," by Fergusson.

The following may be taken as a general summary of the principal features of the style, as well as we can give them without copious reference to illustrations; added to which are a few hints as to their modification to suit modern requirements and taste.

All the buildings which are handed down to us are built of stone only, neither brick nor timber having been a favourite in Scotland for external work. This fact may have the tendency to impress us with a belief that stone is the only material for building in the style; this, however, is by no means proved, and we are of opinion that very good effects may be obtained by the use of brick and stone combined, as in the Gothic and Elizabethan styles.

Old Scotch architecture is not particularly rich in doorways, and this may be easily accounted for, as most of its examples are of a castellated nature: and in buildings intended for defence small and massive doorways are important. The most usual form of the door is square-headed, with the jambs and lintel beaded, and specimens of this class may be found in almost every building of the style. Sometimes the lintel is surmounted by a recessed panel filled in with coats of arms, monograms, or other devices. When the upper portion of the doorway and the panel are further ornamented by a projecting string-course or corbel-course, caused by the thickening of the wall above, a very pleasing and characteristic design is the result. Semicircular and semioctagonal headed doorways are not uncommon, and the latter when richly moulded have a good effect. Many of the late examples have Classic details, and in their general design bear a strong resemblance to simple Elizabethan work. These the student should avoid, rather adopting those which incline to the mediæval type, several of which are to be found in the earlier and purer structures. A good round arched doorway exists at Crichton Castle.

In modern designs for dwelling-houses, considerable licence must be taken with the entrance doorways, and any degree of richness may be indulged in. The style supplies plenty of material for the skilful designer to work with.

The windows are almost universally square-headed; and their jambs and lintels finished with the bead mould, which is usually stopped near the sills in the fashion of an ordinary chamfer. These windows are generally quoined in their jambs in the usual way. A slightly projecting margin of flat dressed stone is sometimes to be found round windows of the style, as at Auchans in Ayrshire. As in the case of the doorways, windows are frequently ornamented with details of a Classic character, but as a rule more successfully. The dormer windows are always picturesque and pleasing in an Old Scotch building, and

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are to be found in great variety. Four good examples are given in the second volume of Dolman's "Analysis of Ancient Domestic Architecture," to which we beg to refer our readers.

The features which give to the style its greatest interest and beauty are its towers and turrets. These are of various designs and sizes, and are invariably grouped in a most picturesque and effective manner. No one can view the towers and turrets of Castle Fraser or Craigievar Castle, without being struck with their great beauty and the splendid architectural crown they form to the massive piles they spring from. Towers of a square shape are generally used as entrance towers, and are finished at top by balustrades or battlemented parapets, and have one or more small turrets corbelled out at their angles. Circular towers which rise from the ground are sometimes finished square at top by having their upper stories corbelled out. These are almost invariably gabled on two sides and roofed in the ordinary way. The small circular turrets are always roofed with lofty pointed slate roofs terminating in finials. Our readers who desire to become thoroughly acquainted with the peculiarities of the Old Scotch towers, and have not the opportunity of inspecting the ancient buildings of the style, should examine the many beautiful engravings in Billings' work on the Baronial Antiquities of Scotland.

As far as towers are concerned, the Old Scotch style gives great opportunity to the modern designer, more so perhaps than the Gothic itself: and in a villa a well-designed entrance tower or angle turret is a feature which never fails to give value and interest to the composition.

We cannot recommend the adoption of the castellated or battlemented tower, which has been so fashionable of late years, for it appears to be a piece of absurdity for us to mimic those features of the old castles which were really used for the purposes of defence. We may use the battlement in a purely ornamental way, but it should be treated so as to be obviously an ornament, and nothing more.

The gables in Old Scotch buildings are almost universally crow-stepped, and are sometimes finished by ornamental stone finials. The chimneys of early examples are usually of a plain character, being carried up in the ordinary square fashion and coped with a deep weathered coping, but ornamental ones are frequently to be met with in late work. The style is very rich in mouldings of a remarkably bold character, which are grouped in large masses under all projections forming corbels and corbel-tables. The billet and cable mouldings are used to a great extent and with splendid effect.

Moulded panels filled with coats of arms, monograms, &c., are very frequently to be found studded over the external walls of the old castles.

Of the Domestic Italian style we need say little; it is too well known in the many forms which it assumes in modern work to require any description. As a style for villa buildings it has its advantages, and where square block-like houses are desired it is unquestionably suitable for the purpose. There is a certain degree of quiet simplicity about the style that recommends it to many. The flatness of its roofs, however, is a disadvantage which belongs to it in common with all the styles of southern birth, and renders it unsuitable for dwellings in exposed situations. To raise the pitch of the roofs in most buildings of the style, would be at once to injure their character and destroy all their symmetry; but if in a villa, for instance, great freedom is taken with all features of the design, and the plan is broken up to a considerable extent, higher roofs than is ordinary may be used.

PLAN.

HAVING in our introduction rapidly reviewed the various styles of architecture most suitable and most generally used for house-building in this country, we now come to the more practical part of our essay, and here propose to briefly consider the subject of the planning and arrangement of dwellings, and the proper appointment of their various apartments. Nothing, however, but very general directions can be given on this subject, for so much depends upon special circumstances and individual ideas.

DINING-ROOM.

We may commence with the dining-room, it being, as a rule, the most important room in a house, and the one from which the other apartments are most usually arranged. In size the dining-room should of course be in proportion to the general scale of the house, and to the other public rooms; but if anything it should be made larger, rather than smaller, than appears necessary from absolute measurements.

In calculating the size of a dining-room, the maximum number of persons it is to accommodate at table should be first decided, and the space they would occupy laid down round a table of sufficient size. The table should not be less than 4 feet in width, and in ordinary-sized houses need not exceed 5 feet. Each person sitting at table would take a space of about 26 inches by 21 inches. Therefore the width to be calculated over table and company ranges between 7 feet 6 inches and 8 feet 6 inches. Space on each side of this for chairs, &c., against the side walls, and passage room has to be provided; not less than 3 feet 6 inches should be allowed, and about 5 feet 6 inches is ample in all ordinary cases. The length of the dining-room is to a considerable extent

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to be influenced by the width decided on; as a general rule, a good room may be laid down with its length and width in the proportion of three to two. If there should be a bay-window at one end or side, it should be added to the above proportionate length, as it does not affect, to any great extent, the accommodation of the apartment, although it adds to its appearance of spaciousness.

Next in importance to the size of the dining-room is its aspect. As it may be taken for granted that in houses of any pretensions the dining-room is only used during the afternoon and evening, an aspect should be selected for it which will secure for it the longest twilight and the greatest coolness. For this purpose the north or north-east is decidedly the best. In ordinary-sized villas, such as this work contains, the dining-room can scarcely be looked upon as an apartment set apart for evening occupation only; it is, on the contrary, very likely to be used for breakfast and luncheon, and under these circumstances the question of its aspect is materially altered. Although the north-east may be considered a good aspect for the dining-room in any case, yet there is no reason why a greater degree of warmth and cheerfulness should not be imparted to it by altering its aspect to the morning sunny quarter, the south-east or south (as in our design for a villa, see Ground Plan, Plate $\frac{S}{4}$).

Dining-rooms may be lighted at one side, or one end, or both side and end, but they should in no case have windows at both ends or both sides. When they are lighted at the side, two or more ordinary windows are the most suitable; but if lighted at the end, a large bay-window will be at once the best and most beautiful style of window to adopt. But, of course, the kind of windows to be used will be dictated by the requirements of the style of architecture in which the house is built, and by the peculiarities of site, prospect, &c.

In dining-rooms it is usual to place the sideboard at one end; and where practicable it is advisable to provide a recess to receive it, or portion of it. This recess may be finished in various ways and made a highly ornamental feature in the room.

The best position for the fireplace is in the centre of one side, but not the side on which the windows are. If possible it should not be in a breast projecting into the room, but be kept flush with the wall.

There are various opinions regarding the proper position for the door in a dining-room, but perhaps the most convenient one is in the side wall at the sideboard end (as in our plans, Plates $\frac{C}{3}$ — $\frac{C}{4}$, $\frac{m}{1}$ — $\frac{m}{6}$, $\frac{M}{5}$ — $\frac{M}{6}$ and $\frac{S}{4}$). It should also open from a good

portion of the hall, and opposite the drawing-room door where practicable, so that the route between the two rooms may be direct and free from turnings.

Care should be taken, in planning a dining-room of any importance, to cut up the wall space as little as possible, for the purpose of accommodating the chairs usually placed against them and for giving ample room for hanging works of art.

We now come to the consideration of the position of the dining-room with reference to the kitchen and serving apartments. Of course it is all-important in the arrangement of this portion of a house, to have everything so planned as to give perfect facility in serving. The route from the kitchen to the dining-room must be as direct as is possible, those apartments set aside for serving only intervening. In ordinary cases a single serving-room, or butler's pantry, is all that is considered necessary between the kitchen and the dining-room. It is highly advisable to have a separate door for serving through, or a proper service wicket arranged in a recess near the sideboard. This recess should have a door towards the room, so as to hide the wicket as much as possible from the company at table. By the above arrangement, the full and empty dishes have not to be carried to and from the dining-room through the public part of the house, and the kitchen apartments can be entirely cut off from it during dinner. When no serving-door is to be provided, the most important thing to consider is to bring the door from the kitchen wing as near the dining-room door as possible. For examples of the arrangement on the service-door or wicket system, see plans, Plates $\frac{f}{1}$, $\frac{C}{3} - \frac{C}{4}$, $\frac{m}{1} - \frac{m}{6}$, $\frac{c}{1} - \frac{c}{8}$ and $\frac{S}{4}$, and on the other, Plates $\frac{E}{3} - \frac{E}{4}$, $\frac{M}{5} - \frac{M}{6}$, &c.

In conclusion, we may remark that in designing a dining-room, care should be taken to make it lofty, to have it well lighted by large and lofty windows, and well ventilated. For artificial lighting by gas, pipes should be fixed for one or two pendants from the ceiling, as the size of the room may demand; and for one or two wall brackets in or near the sideboard recess.

It is neither necessary nor advisable to have any lights on or near the mantelpiece.

DRAWING-ROOM.

This is the next important room in a dwelling-house; and the one in which the greatest taste and artistic skill are demanded. The planning of the drawing-room cannot be reduced to rule in the same way as that of the dining-room; the chief consideration being to make it an elegant, light, and cheerful apartment. The drawing-room is used both in the daytime and in the evening, and therefore it is essential that it should be made to look well by daylight and gas-light—cheerful and bright during the former, and brilliant during the latter.

As the drawing-room is in nearly every respect the reverse of the dining-room, the most suitable aspects for its windows are those which are least to be recommended for the proper dining-room. The south and south-east are generally acknowledged to be the best quarters for the principal windows; and if the room has a bow-window it should, if possible, look towards those quarters.

It is important to have the drawing-room well lighted by large windows, which should be carried almost to the floor, and as near the ceiling as their finishings and the cornice of the room will allow. It is a very convenient arrangement in country villas to have one of the windows constructed to act as a door, leading out into the garden, or on to the lawn, as the case may be. A small conservatory added to the drawing-room, and opening from it by one of these window-doors, is a very desirable adjunct, and it should be made to act as a porch between the drawing-room and the garden.

The drawing-room may be lighted from one end, or one side, or both, and when practicable should have a large bay-window, which is always a beautiful and convenient feature in the room. Two bay-windows may be introduced in some cases with perfectly satisfactory results, but it is advisable to let them assume different shapes for the sake of variety, and to give greater character both to the interior and exterior.

In size the drawing-room should not be inferior to the dining-room, and, as a rule, its size may be decided from that found necessary for the latter apartment. It need not be made of the exact length and width or of similar proportions, but its floor should contain about the same number of superficial feet. As a rule, the drawing-room should be

larger, rather than smaller, than the dining-room, because the articles of furniture that will be placed in it will be more numerous and more distributed, than those of the latter apartment.

The position of the fireplace is most convenient when in the centre of one side wall; but it may be at one end if the room is not large or of a long shape. In large drawing-rooms, or in those above 30 feet by 20 feet, two fireplaces will be necessary.

The door should open from the best part of the hall, and as near the main entrance as possible. As the drawing-room is largely used for the reception of visitors calling during the day, and as it is in it that company usually assemble before dinner, it is advisable that the door should not be too far away from the vestibule. On the contrary, it is advisable, in the case of the dining-room, that the door should be situated as far from the entrance as is convenient, so that the apartment may appear to be well in the body of the house.

The morning-room may be connected with the drawing-room by an ordinary or folding door in the case of moderately sized villas, as such an arrangement is at times very convenient. In the plan of the Elizabethan Villa, Plate $\frac{8}{4}$ the drawing and morning rooms are connected by folding doors; and it is obvious that when these rooms are opened into each other, they would form a very spacious apartment for the entertainment of guests on extraordinary occasions. It is obvious that when a morning-room is connected with a drawing-room, it must be made an apartment of more importance in every way than is required when it stands perfectly distinct from the other rooms.

It is advisable to leave as much wall space in a drawing-room as possible, so that furniture and pictures may be displayed to advantage. The ceiling should be tastefully and lightly ornamented. More drawing-rooms are spoiled in effect by the massive and clumsy loads of plaster details which are distributed with lavish hand upon their cornices, ceilings, &c., than by any other means. As drawing-rooms are usually lighted by pendants from the ceilings, plaster centre ornaments are required; these should be very carefully managed, so as to prevent them from encroaching on the domain of ugliness. They should be designed of an open and light character, well connected with the ceiling by having their outside details in slight relief, and gradually softened away to the plain surface. The cornices of drawing-rooms should never exceed in depth the proportion of one-twelfth the height of the room, but may be made less with propriety. They should be composed of light members, and have few but elegant enrichments. Indeed,

effect should be sought in cornices, as a rule, by the judicious application of colour on plain members, rather than by the vulgar display of cast work in plaster of Paris.

It is unnecessary to remark that a drawing-room should be lofty and well ventilated. For artificial lighting by gas, pipes should be laid for one or two pendants and for two or three wall brackets in convenient situations.

MORNING-ROOM.

In villas of any size or importance, a morning-room is a most desirable, and indeed an indispensable apartment. It is used as a breakfast-room and sometimes as a luncheon-room, thus relieving the dining-room of a great deal of unnecessary wear; and as the family usually sit in it during the earlier part of the day, it also spares the drawing-room, and allows it to be kept more select than it possibly could be if constantly used.

The morning-room should be kept as near the kitchen department of the house as possible, only being second in this respect to the dining-room. Its size, as a rule, should be about two-thirds that of the dining-room, and it should be of a squarer shape than that apartment. It should be lighted on one side or end by a bow-window, or on one side and end by a bow and an ordinary window, as shown on Plate $\frac{S}{4}$.

We have mentioned in our remarks on the drawing-room, that the morning-room may be at times conveniently made to open into that apartment by folding doors, so that when necessary both rooms may be thrown into one. The position for the fireplace is in the centre of one side wall. The position of the door is not of so much importance as the doors of the other entertaining rooms, but it is advisable for it to be placed as near the principal staircase as is admissible, with due consideration to its relation to the culinary department. Wall cupboards are useful adjuncts to the morning-room, and may be introduced if the room is of sufficient size to leave enough wall space for furniture. Where there is no separate library provided, it is usual to make the morning-room serve as one, and under these circumstances it is always advisable to contrive to leave one wall unoccupied, so that it may have a large bookcase placed against it. The aspects most proper for the morning-room are east and south-east, and either of these should be selected if possible. But in ordinary-sized villas, where the dining

and drawing rooms have first to be considered, it is almost impossible, without great loss of space and sacrifice of compactness, to assign the most eligible position to the morning-room.

One of the windows of the morning-room may be made to open as a door to the garden or lawn.

LIBRARY.

Although the villas illustrated in this work are not of sufficient size to warrant us in adding a library to their other entertaining rooms, we consider it advisable to say a few words on that apartment here. The best aspects for the library may be said to be east and south-east, although aspect is not of so much importance in this apartment as in others. It is difficult to give even a proportionate size for the library, as the purposes for which it is set aside vary so much. For instance, it is sometimes used as a library and a study only, in which case its size will be dictated by the collection of books and the literary pursuits of its proprietor. At other times it may be made to contain a museum as well as books, when its size may require to be equal to all the other public rooms put together. It is, however, under ordinary circumstances much more likely to be used as a general business room for the gentlemen of the house, or, during the early part of the day, as a gentlemen's lounging room; when used in the latter capacity its position should be as near the main entrance as possible, but when used as a library in the proper sense of the word, it may be placed in connection with or between any of the other public rooms. The windows of the library should be rather along one side than at one end, especially if the room is, as it should be, of long proportions. Of course, no definite rules can be given for the lighting of the apartment when it assumes large proportions, beyond the general rule that it should be well but not over lighted. Ample wall space must be left for the bookcases, and one or more fireplaces may be placed on one side, or one at each end.

Great care should be taken to have the apartment well ventilated, and if it is to contain a valuable collection of books, it should not be lighted by gas unless it is of very lofty proportions, and the lights concentrated in the ceiling in the shape of a sun-burner. It is a well known fact that gas is most injurious and destructive to the bindings of books.

BILLIARD ROOM.

A billiard-room, like a library, is an apartment that is not indispensable, or even usual, in villas of moderate size. We have thought it proper to add it to only one of our designs, by way of illustration, shewing in what manner it may be most conveniently added to an ordinary-sized house. In large villas it is usual to build the billiard-room of one story in height, and to have it almost detached from the main body of the house. The advantage of this is that it can be lighted from the roof, which is highly desirable as the skylight illuminates the table and casts no shadows. Of course, where billiard-rooms are intended for evening use only, the mode of lighting by day is not of so much importance, and a billiard-room such as shewn on Ground Plan, Plates $\frac{c}{1} - \frac{c}{8}$, is all that is required. In deciding the size of the billiard-room it is only necessary to allow from 5 to 7 feet all round the table. The usual dimensions of the table being 12 feet by 6 feet, the room ought to range in size between 22 feet by 16 feet and 26 feet by 20 feet. The position of the billiard-room is not of so much importance as that of the other public rooms. It should when possible have a gentlemen's room or small dressing closet near it, or opening from it, as shewn on plan previously alluded to.

It is not uncommon, when a large room is added to a villa, for the ostensible purpose of accommodating a billiard-table, to make it also act as a music saloon, in which case a recess may be provided at one end for an organ. The billiard-table may be made to rise and fall by a hydraulic contrivance, so that it may be lowered to the basement out of the way. It is not to be expected that professed billiard-players will approve of this; but it is a good plan when the proprietor's tastes are equally balanced between music and billiards, and when he cannot afford the luxury of two large rooms in addition to those which are indispensable.

It is a matter of great importance, that, when the billiard-table is a fixture, preparation should be made to insure it a foundation which will prevent the possibility of vibration; therefore if the room is not excavated underneath, a dwarf wall the size and shape of the table should be carried up to receive the legs. If, however, there should be an

apartment underneath, care must be taken to make the floor of the billiard-room perfectly rigid, and without any liability to spring. This may be done by introducing either light iron girders with brick arches between, or trussed beams and strong joists.

It is advisable to heat large billiard-rooms by a system of hot air flues, or water pipes, but in smaller rooms an open fireplace is all that is necessary.

In lighting a billiard-room with gas, provision should be made for two or three pendants, directly over the table. If the room is half-billiard, half-concert room, it should be lighted by a large pendant in the centre and a series of wall brackets.

GENTLEMEN'S ROOM.

In villas of any size it is advisable to introduce a gentlemen's room. This apartment, which also serves as a cloak-room, should be as near the entrance vestibule as possible. The most convenient position is shewn on Plate $\frac{8}{4}$.

The gentlemen's room should be furnished with a water-closet and marble washing-stand, and should be of sufficient size to accommodate a small dressing-table and a cloak-stand.

HALL.

There is no feature in the interior of a house which claims more attention than the entrance hall. It is there that visitors make their first acquaintance with the interior, and form their first impressions of its character. Of late years it has been customary, from a desire to save money and space, to reduce the hall in ordinary-sized villas to little better than a passage. This custom has gradually extended itself to villas where one should reasonably expect to find the hall assuming the importance due to it.

It is not to be recommended that in small residences the hall should be made to appear as if the whole interior were sacrificed to it, but at the same time, it should not be cramped and contracted if it is possible to avoid it. In small villas it is usual to let the staircase rise from the end of the hall, forming a direct continuation of it. as

shewn on Ground Plan, Plates $\frac{c}{3}-\frac{c}{4}$, or branch from it at right angles, as in Ground Plans in Plates $\frac{E}{3}-\frac{E}{4}$, $\frac{m}{1}-\frac{m}{6}$, and $\frac{c}{1}-\frac{c}{8}$, the hall not being more lofty than the Ground Floor apartments. In villas of more pretensions, the hall may assume a more developed form, and be in size almost equal to the large public rooms, in which case it is usual for it to run up through all the floors and be ceiled at the roof. When such is the case it is necessary for it to be galleried round at the level of each floor.

In the case of the Elizabethan Villas, the Plans of which are shewn on Plates $\frac{s}{4}$ and $\frac{s}{5}$, the hall assumes the medium treatment between the two former classes. It is of considerable size, having the staircase occupying its lateral part, and having its front portion galleried. This latter style of hall is perhaps the most suitable for moderately-sized villas, and may be rendered very beautiful if the staircase be treated in a tasteful manner, and if it be lighted by a large window filled with ornamental glass. We may remark that this style of hall is only to be recommended for villas of two stories, as in our last-mentioned design.

Large galleried halls should be lighted from the roof by ornamental skylights, or by windows placed under the cornice, or by both combined. Halls of moderate size are best lighted by large end windows, which of course may be made, in Gothic or Elizabethan houses, very ornamental features.

Many opinions exist as to the best mode of warming the hall. It may be done in various ways—by a system of hot water pipes, by hot air from a gill stove placed in the basement, by an ornamental gill or other description of stove, placed in a convenient position on the floor of the hall, or by an open fireplace or fireplaces. When it is desired, as is sometimes the case, to heat the whole house from the hall, the best method of doing so is by hot air from the apparatus in the basement; but when the heating of the hall is all that is required, a stove placed in the position shewn on plan, Plate $\frac{s}{4}$, with an underground flue, or a large fireplace is sufficient.

In Gothic or Elizabethan houses, the hall fireplace may be made a highly ornamental feature.

The ceiling of the hall may be finished in various ways according to the style of architecture in which the house is built. For instance, if it be Italian, Elizabethan, or Old Scotch, it may be finished in plaster, flat, arched, or coved; or if it be in Gothic, it may be open timber, and arched or panelled with wood only, or with wood and plaster. All these ceilings should be decorated with colour.

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It is always advisable to have a vestibule between the entrance door, or porch, and the hall proper, for the purpose of protecting the hall from cold air and draughts, and keeping it more in the interior of the house, and hence securing it the comfortable qualities of an apartment.   In small villas it is usual to cut off a portion of the hall at the entrance door by a screen, having doors glazed with ornamental glass, making this part serve as the vestibule, as shewn in plans on Plates $\frac{C}{3} - \frac{C}{4}$, $\frac{m}{1} - \frac{m}{6}$, and $\frac{M}{5} - \frac{M}{6}$, When there are close porches, as in plan on Plate $\frac{E}{3} - \frac{E}{4}$, the vestibule may be dispensed with.   A very good arrangement of the porch, vestibule, gentlemen's room, and hall, is shewn on Ground Plan, Plate $\frac{S}{4}$.

STAIRCASE.

The position of the main staircase in a villa varies according to circumstances and taste.   It may occupy a portion of the hall, or branch off from it.   Both treatments are illustrated in our various designs.

The staircase is unquestionably one of the most important features in the interior of a house, and offers a wide field for artistic skill, especially in buildings of the Gothic and Elizabethan styles.   The most suitable materials for staircases in moderately-sized dwellings are timber and iron, that is, timber for the steps, handrails, newel posts, &c., and iron, wrought or cast, for the balusters.   But in mansions or very large villas, stone may be used for the steps, and where they are supported on solid walls at both ends, the balustrade may be a continuous arcade of stone or marble.   Iron balusters, supporting a massive wooden handrail, are also suitable for stone staircases.   Elizabethan staircases should, where expense is not an obstacle, be constructed of oak with moulded and carved notch boards, massive newel posts at every angle, and moulded handrails.   The balusters supporting the latter should be of oak turned and carved, but rich iron balusters may be used instead.   Gothic staircases should also be of oak, with notch boards, newels, and handrails, having balusters, arcading, or continuous scroll work of wrought iron, painted and gilded.

Wood may be substituted for the iron work and the handrail supported on neatly chamfered and moulded balusters, or a continuous arcade with small turned columns,

which may have their shafts of a different species of wood from the rest of the staircase. We have given, on our Plates, illustrations of the different styles of staircases.

KITCHEN.

The position of the kitchen, with its attendant offices, is a matter of quite as much importance as any of the other apartments of a dwelling-house. It is necessary that it should be kept as distinct as possible from the remainder of the house, but at the same time in a position which will render the service to the dining-room and breakfast-room direct and short. The usual position of the kitchen offices is at the back of the main buildings, and they generally occupy a wing devoted to them or built for their reception, as far as the Ground Floor is concerned. Surrounding the kitchen, or in close proximity to it, should be placed the larder, cook's pantry, and scullery. It is advisable that the latter should open direct from the kitchen. The store-room should also be within a short distance of the kitchen, and should, along with the butler's pantry or service-room, be placed *en route* to the dining-room.

It is obvious that the kitchen in a large mansion must be a widely different affair from that in a moderately-sized villa; and as we are confining ourselves in all other cases to matters which relate to dwelling-houses on a moderate scale, such as this work illustrates, we must be pardoned if we do not enter into the description of the kitchen in its most developed form, and confine ourselves to those such as our designs exhibit.

The size of the kitchen should, of course, be in proportion to the size of the house, and in moderately-sized villas, not exceeding the largest illustrated in our work, it may range between 15 feet square, and, say, 20 feet by 18 feet.

The first important feature to be considered in the interior of the kitchen is the fireplace or range. This should be placed if possible in an end wall, furthest from the door which communicates with the public portion of the house. It is usual to provide two recesses, one for the general cooking range oven, boiler, &c., and the other for the hot hearth, as shewn on plan, Plate $\frac{S}{4}$; but in small houses, one recess may be considered enough to accommodate the usual complete range with oven and boiler attached. Next in importance to the fireplace is the lighting. It is very necessary that all kitchens

should be thoroughly lighted; and for this purpose a large window should be placed in a side wall flanking the fireplace when possible, as shewn on plans, Plates $\frac{C}{3}$ — $\frac{C}{4}$, rather than opposite to the range. But where it is desirable for architectural reasons to have an end window, that is, a window opposite the fireplace, it is advisable to insert another window which will flank the range, as shewn in plan, Plate $\frac{S}{4}$.

Every care must be taken to have the kitchen thoroughly ventilated and rendered as cool an apartment as possible: and for this purpose the kitchen should be made as lofty as the design of the house will admit of, and air flues placed at the ceiling line to supply cold air brought from the exterior, while others opening into the smoke flues should be provided, to remove the vitiated air and the odours arising from the cooking.

Where practicable it is advisable that the kitchen, when attached to the main house, should be carried through two stories; or when built in a wing of one story, it should be made lofty and have the space between its ceiling and the roof as a vitiated air chamber, with ventilating openings in the ceiling and in the roof to the external air.

The door from the kitchen to the public portion of the house should be as far away from the fireplace as possible; another door should be provided giving access to the scullery or a lobby with which the scullery communicates, and into which the back door opens. Where a lobby is not provided the back door may be made to open into the scullery direct, or into the kitchen and scullery, as circumstances may dictate, through a closed porch which will prevent draught or other inconvenience.

The floor of the kitchen is most usually of stone or tiles, but wood may be used if warmth and comfort are required, as would be the case if the kitchen is used as a sitting-room for the servants. It is not unusual to have the floor of the kitchen partly wood and partly stone, the latter being carried round the fireplace.

As the walls of the kitchen are continually liable to the action of fumes and steamy vapour, it is advisable, where expense is no object, to cover them entirely or partly with glazed tiles. A very good effect may be obtained by using white tiles for the upper part of the walls, from about four feet from the floor, the under part being covered with plain, coloured, or patterned tiles, divided from the white by an ornamental border. Where tiles are not used for the whole walls it is advisable to adopt the dado of coloured tiles, as above recommended, as it prevents the walls from being easily damaged, and allows them to be readily cleaned where they are most liable to become soiled.

In brick houses of the Gothic style very ornamental kitchens may be finished entirely

with enamelled bricks, or with a dado of them or glazed tiles, and the walls over of ordinary pressed bricks. When the ceiling is proposed to be of varnished timber work, a cornice of moulded bricks should be carried under it.

SCULLERY.

The scullery should in all cases adjoin the kitchen, and open immediately from it when practicable. It must on no account be separated from it by more than a small lobby as shewn on Ground Plans, Plate $\frac{C}{3}$—$\frac{C}{4}$, and Plates $\frac{E}{3}$—$\frac{E}{4}$ and $\frac{S}{4}$, where the scullery opens directly from the kitchen by a door placed close to the fireplace.

The scullery should have another door giving access to the kitchen yard; and should have a fireplace, a boiler, and space for the accommodation of one or two coppers for boiling vegetables, &c. It should also be fitted with a sink, to which a hot and cold water supply must be carried. A cold water supply should also be laid on to the boiler.

The floor should in all cases be of stone, laid with an inclination towards a trap for carrying off moisture.

Like the kitchen, the scullery should be well lighted and ventilated.

In large sculleries where it is intended that cooking should be carried on to any extent, the walls may be covered with glazed tiles, and indeed it is to be recommended that they should in all cases be cemented, if tiles should be considered too expensive; as a great deal of steam is of necessity generated from the boiler and coppers, and a considerable amount of moisture is always present from the great quantity of water used in washing dishes and preparing vegetables, &c.

It is convenient to have a closet opening from the scullery for containing kitchen utensils.

The cold larder or cook's pantry is usually attached to the scullery, although it may conveniently open from the kitchen instead.

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LARDER.

The larder should, whether it opens from the kitchen or scullery, be placed as far away as possible from the fireplace or any fire flues, as it is necessary that it should be kept cool. It is also necessary that it should have a window to the exterior for the sake of fresh air and ventilation. The custom of building larders with borrowed lights from the interior, is to be condemned, as it prevents the possibility of getting a continual supply of fresh air. The shelves of a cold larder should be of stone or slate; but if they are made of wood, for the sake of cheapness, they should consist of lattice work, or of bars with intervals between.

The windows of the larder should either be filled entirely with wire gauze or finely perforated zinc, or the lower half with glass and the upper with gauze or zinc. It will be necessary to provide a glazed shutter to the ventilating portion, so as to protect the larder during frost. Iron stancheons should be provided to protect the window.

STORE-ROOM.

As we mentioned before, it is advisable that the store-room should be placed as near the kitchen as is possible, and between it and the dining and morning rooms. This room usually contains the family stock of groceries, and such like; and where a separate china closet is not provided, it contains the services of china and glass not in constant use.

The store-room should be well lighted and ventilated; it is also necessary that care should be taken to have it kept perfectly dry.

The furniture of the store-room usually consists of shelves and cupboards, which may be arranged to suit individual requirements.

For size and best position of store-room, see Ground Plans, Plates $\frac{C}{3} - \frac{C}{4}$, $\frac{M}{5} - \frac{M}{6}$.

BUTLER'S PANTRY.

The butler's pantry in small and moderate-sized houses, is an apartment used for various purposes. In those where the services of a butler are not required, the pantry is principally used as a serving-room, a repository for glass, china, &c., in constant use, and for such articles as a refrigerator, plate-safe, &c.

When used as a serving-room it should occupy a position in the direct route from the kitchen to the dining-room. The service may be through it, as in Ground Plan, Plates $\frac{c}{1}$ — $\frac{c}{8}$, or it may open from the service passage, as shewn in Ground Plans, Plates $\frac{c}{3}$ — $\frac{c}{4}$, $\frac{s}{4}$. In small villas the butler's pantry, so-called, is but a small apartment, serving the purposes of a store-room and china-closet, and but little used as a serving-room. In such a case its position may be that shewn on Ground Plan, Plates $\frac{E}{3}$ — $\frac{E}{4}$. In large houses it is usual to have the butler's bedroom opening from the pantry, and a properly built plate-safe opening from the bedroom.

The usual furniture of a butler's pantry is a small dresser with sink and drainer, a set of drawers, and lock-up cupboards.

WASH-HOUSE AND LAUNDRY.

In houses of any pretensions a wash-house and laundry are almost indispensable, either attached to the kitchen offices, or forming a separate building placed at a short distance from the house. This latter arrangement is sometimes to be recommended, especially when the house is of such small size as to render it possible for the objectionable odours from the wash-tubs to penetrate to the public apartments. In most of our designs for villas we have omitted the wash-house, laundry, &c., for the reason just given. We may remark that should it be desired that they be added to any of the designs, it will be advisable to have no communication by a door or other opening with the house, but that they be furnished with external doors only.

It is not unusual, where it is undesirable to increase the extent of the outbuildings, to place the wash-house and laundry in the basement underneath the kitchen and scullery, with an external stair to same. This arrangement is intended in the plan of Elizabethan Villa, Plate $\frac{s}{4}$

The size of the wash-house in ordinary cases may range from 15 feet square to 20 feet by 16 feet. It should be well lighted and ventilated. Ample provision should be made for the escape of steam, by having a large ventilator in the ceiling communicating with a louvred ventilating turret in the roof.

The walls should be covered with cement, and the floor must be of stone laid with an inclination to a drain for carrying off water. The furniture of a wash-house consists of a washing bench containing two or more square tubs formed with sloping sides, each furnished with hot and cold water taps, and a waste pipe, with plug, socket, and chain, and a boiler for boiling water and clothes. It is also advisable to provide an open fireplace. The laundry is usually attached to the wash-house, with a door of communication between them. Its size should be about that of the wash-house, though it may with propriety be made a little larger. As it is used for ironing and dressing clothes it is only necessary for it to contain as permanent fixtures, a large ironing table, placed in the direct light of the windows, and an ironing stove for heating the irons. Room must also be provided for a spare table and portable mangle, &c. The floor of the laundry should be of wood, and otherwise it should be made a comfortable and warm apartment.

OUTBUILDINGS.

It is necessary to have attached to villas of all sizes in the shape of outbuildings, a coal-house, ash-pit, and privy or water-closet; and it is desirable to add to these a wood-house, and a tool-house in the case of villas of any importance. The outbuildings are usually built against one wall of the kitchen yard or court, by which they are hidden from view. The coal-house should always be roofed, and have a wicket in the outside wall, and a door to the court. Its floor may conveniently be made a foot or eighteen inches under the level of that of the court. The ash-pit should not be covered in. It should, likewise, have a wicket in the exterior wall and another to the court,

about three feet above the level of the ground. It should be sunk at least four feet under the level of the court, and have a proper trapped drain to a sewer or cesspool. The privy in the case of country or suburban residences may be of the ordinary open kind, but it is always advisable to fit it up with a water-closet apparatus, in which case the soil must be conveyed to a cesspool or sewer.

CELLARS.

The cellars usually placed in the basement of moderately-sized villas are, the wine cellar, beer cellar, and vegetable cellar. To these are sometimes added a cellar larder, a bottling cellar, a spare or lumber cellar, and a place for cleaning shoes and knives in. In large houses all the cellars, except those in connection with the wine and beer cellars, are usually placed under the kitchen wing, while the wine cellar, beer cellar, bottling cellar, store for bottles, casks, &c., occupy the basement under the main building.

The most important of all cellars is, of course, that devoted to the storage of wine, and we shall first describe it; indeed, it is the only one that requires particular description. It should in all cases be placed as near the centre of the basement as possible, so that a uniform temperature may be obtained during all seasons. If there be a central hall provided, such as in design, Plate $\frac{S}{4}$, the wine cellar may conveniently be placed underneath it.

The wine cellar must be fitted up with bins for holding the bottles; these should be constructed of brickwork with strong flag shelves. Their size varies in height and width according to the general capacity of the cellar, but their depth is, in almost all cases, sufficient to hold two rows of bottles, or about 23 inches. The floor should be of polished flags, and the ceiling may be vaulted with brickwork, or lathed and plastered to the joists of the floor above. When of the latter description, a thick layer of concrete should be laid between the joists in the same manner as for deafening. When wine in wood is kept, it may be stowed in the ordinary wine cellar or in a vault adjoining or opening from it, and ample convenience for lowering the casks must be provided. There should in no case be a window provided in the wine cellar, because it would prevent the possibility of retaining an equal temperature. It is important that, when the wine cellar

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is detached from the general cellars, it should have an independent stair that can be readily reached by the butler and the master of the house.

The next cellar of importance is that which is used for the storage of beer and other common drinks. This in ordinary houses need not be large. It must be lighted and furnished with a well-hole for lowering casks, &c. The bottling cellar forms a very useful adjunct to both the wine and beer cellars, and a small cellar for holding empty bottles is also a convenience. The three cellars last mentioned should be floored with flags, and the beer and bottling cellars should have their floors inclining towards traps in connection with the drains, for carrying off any moisture, and they may be furnished with bottle racks and stillages for supporting the barrels.

A vegetable cellar is almost necessary, in ordinary cases, for holding potatoes, &c. This cellar should be placed in as dry a situation as possible, and though light and ventilation are necessary, arrangements must be made to protect the contents from frost.

The cellar larder should be, in all particulars relating to light, ventilation, &c., similar to the vegetable cellar. It is commonly used for keeping fruit, cheese, and such articles as do not require a continuous supply of air. In summer, meat may be kept here, away from flies and heat.

The other cellars mentioned call for no special notice.

BEDROOMS.

In villas, it is usual for the sleeping apartments to be placed on the first floor, which is, when there is no higher story, commonly called, by way of distinction, the bedroom floor. In dwelling-houses of more than two stories, the principal bedrooms and their adjuncts occupy the first, while the others are placed on the second, or second and third floors, as the case may be.

The primary considerations in planning the bedroom floor of a house are, firstly, to have all the rooms of a useful size, and in direct communication with the main landing. In a very large house it is impossible to have all the rooms on the floor opening direct from the landing or gallery, and in such a case the principal bedrooms should be arranged round it, while those of lesser importance may be reached by a passage or passages

which branch from the landing. Secondly, to have the rooms well lighted and of sufficient height to insure their being airy and healthy. It is most important that all sleeping apartments should not only contain a large quantity of air, but that means should be arranged for a continual supply of it during the night. Perhaps the most efficient way of doing this, as well as the simplest, is to have openings made over the door from the landing or passages, near the ceiling, covered on both sides of the wall with wire cloth, or finely perforated zinc. Shutters may also be provided to close these openings if such is desired. Thirdly, so to dispose the doors, fireplace, windows, &c., as to leave convenient space for the bed and the other necessary furniture, which commonly consists of a dressing-table, wash-stand, wardrobe, small table, and several chairs. In large bedrooms additional articles of furniture to the above enumerated will be required; but as it is usual to provide dressing-rooms to the principal bedrooms, they relieve them of a considerable portion of the furniture they would otherwise have to contain.

In planning bedrooms it is advisable to keep these general facts in view; that the bed should stand with its head against a wall, but with space on both sides of it: and that it is always advisable to have its side towards the window, and not its end; for if it is placed end towards the light, the occupant will experience considerable annoyance during the morning hours, and especially when the window has an eastern aspect. The modern style of bed renders the latter precaution very necessary, there being no end curtains to cut off the direct rays of light.

DRESSING-ROOM.

In all houses of any pretensions, one or more dressing-rooms should be provided, opening from the principal bedroom or bedrooms. Dressing-rooms vary in size, but except in very large houses they need not exceed 20 square yards in area, which will give a convenient-sized room. They must be well lighted, and should have fireplaces where practicable. Care should be taken to have the principal dressing-room furnished with a fireplace and have its window in a good aspect, as it is desirable to have it as airy and cheerful as possible. Besides the door from the bedroom, every dressing-room should have an independent door from the landing or passage. It is advisable that a hot and cold

water supply should be laid on to dressing-rooms, in which case a permanent marble wash-stand with waste pipes complete should be provided.

NURSERY.

It is convenient in all houses, except those of very small dimensions, to have a large room set apart as a nursery. This should be a cheerful, well lighted and ventilated apartment, for children usually spend much of their day-time in it. The nursery should be placed either in close proximity to the bath-room, or what is still better, it should have a small dressing-room fitted up with a bath, water-closet, and wash-stand, having a hot and cold water supply. The most convenient position for the nursery is where it divides the servant's apartments from the principal portion of the house. In houses such as this book illustrates it is not necessary to have a night nursery suite, but we may mention here that it should comprise a good airy bedroom, a small apartment attached fitted up with bath, &c., also a small bedroom for the nurse opening from it.

BATH-ROOM.

It is now generally acknowledged that no house is complete without a bath-room. This apartment should be on the principal bedroom floor, in such a position that it can easily be reached from all the bedrooms. It is not important that it should be a large room, although it should be of sufficient size to accommodate a good-sized bath, water-closet, and wash-stand. It is advisable, where convenient, to have a separate water-closet on the same floor or on the floor above.

HOUSEMAID'S CLOSET.

The housemaid's closet, usually situated on the first floor, is a small apartment, fitted up with a large sink with waste pipe to carry away the slops from the bedrooms, and furnished with hot and cold water pipes to supply the bedrooms with water. It should be placed as far away from the principal bedrooms as possible. The most favourable positions for same are shewn on Bedroom Plan, Plate $\frac{s}{5}$.

LINEN CLOSET.

This closet, which is used for the storage of bed and toilet linen, may be placed on any of the bedroom floors. It should be fitted with shelves or presses, as choice may direct.

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BUILDING MATERIALS,

AND THEIR TREATMENT.

IN this, the concluding portion of our Essay, we propose to offer a few remarks on the usual building materials, the correct method of treating them, and to give a few hints in connection with the painted decoration of dwelling-houses. It will not be necessary for us here to treat of the scientific principles of building construction, as that subject is ably discussed in other works in the possession of every builder. We shall therefore confine ourselves to that which is seldom written about, viz., the artistic treatment of the ordinary building materials, more particularly Brick and Wood. We shall first, however, briefly touch on the subject of Ornamental Stone-work.

ORNAMENTAL STONE-WORK.

In the minds of most persons stone is considered the only proper material for the exterior of buildings, but this is by no means a settled question; and this idea has done more to injure the architectural appearance of our cities and towns, in England particularly, than anything else, for where stone is rare and expensive, builders have adopted the mean and paltry expedient of imitating stone-work by cementing their brick buildings. That there is no necessity to disguise honest brick-work when it can be made ornamental in itself, we hope to shew when we come to speak of brick-work. But it is almost unnecessary for us to advocate the cause of brick-work *versus* cement at the present time, when so many of our architects and men of taste are preferring it, associated with a small proportion of stone-work, in buildings, to the exclusive adoption of stone.

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In districts where stone is plentiful, it is of course the most natural and proper material to use; and if due regard is paid to coloured effect by the use of more than one description of stone, there will be little left to desire as far as material is concerned. It is obvious that if we build our houses of one colour of stone, a painfully monotonous effect is certain to be the result, unless we cover them with an exuberance of carvings, mouldings, and the like, which are mainly valuable because they rectify the monotony of plain wall surfaces, and introduce effect by casting distinct shadows. We are all well aware that in Italy the value of colour in structures faced with marble is duly recognized, and that in them mouldings and carvings are neither so plentiful nor rich as in the stone buildings of the best periods of northern architecture. We are aware that it is not the use of colour alone that led the Italian architects to be moderate in their use of deeply-cut mouldings and carvings, but that the brightness of their climate was equally potent.

At the present day, while economy is so much sought after, and when every attempt is made to reduce the expensive labour incidental to the introduction of properly developed mouldings and carvings, we cannot do better than take a lesson from the Italians, and recognize the value of colour in giving effect and character to our exteriors. We may safely say that an arch composed of alternate voussoirs of buff and red, or buff and blue stone, with a simple edge moulding, such as a bead or notch, is as effective and more pleasing in a buff or grey stone front, than one in the same material as the walls with ten times the labour in mouldings and ornament, not taking into consideration its superior durability. And the effect of a row of coloured arches, if they are tastefully carried out, will give quite life enough to relieve the most monotonous wall they may be placed in.

In addition to the arches alluded to, such features as base-courses, strings, and cornices may with great effect be inserted in stone of a different colour to that used in the wall spaces.

The introduction of granite and marble in stone buildings is now becoming pretty general, and for such features as medallions, columns, and pilasters they may be used with the certainty of a good result. For external work, in our climate, granite is the only material that will retain a polish permanently; but its expense will greatly retard its general adoption in ordinary buildings. For light stone buildings the red granite is most suitable; the grey being too weak in colour to recompense one for its introduction. It may, however, be associated in a subordinate capacity with red, with a satisfactory effect.

As remarked above, in speaking of parti-coloured arches, the use of a differently tinted stone gives effect to buildings, and therefore there is no reason why columns and pilasters should not almost universally be introduced, either in some dark-tinted stone, slate, or unpolished marble, wherever the construction admits of their being detached from the general stone-work.   Coloured columns in Early Gothic work, having bases and capitals of light-coloured stone, may with propriety have one or more bands of that stone in their length.   These bands, apart from their artistic value in imparting emphasis to the coloured shafts, do optically as much as practically tie them into the general stone-work of the building.

Leaving the class of work we have been hinting at, we may now say a few words relative to the more humble style of stone-building.   It is always advisable, in stone exteriors, to build the general wall surfaces either of a different-coloured stone to the finishings and ornamental work, or of the same stone differently treated.   We do not wish to imply by this, that it is anyways advisable to build the wall surface as if it was merely a necessity, or a foil to the ornamental work; there is no reason why the wall surface should not be as good in its way as the ornamental portions of the building. We shall presently show, in speaking of brick-work, that the general wall spaces are as much to be depended upon for beauty and architectural effect, as those parts which are usually elaborated for the purpose of giving architectural character.

The modes of building walls vary in different localities, being dictated by the materials most easily obtained, or natural to the districts: and when buildings of an ordinary character are to be erected, it is the most natural and advisable for the builder to adopt the mode of building which has been born of necessity.

It is a general principle in building, and one which should be respected as far as possible, that the materials of the district, and the manner of using them found by long experience to be the best, should be adhered to.

In ornamental structures, or in those where some particular character is desired, it is usual to adopt materials peculiar to other and distant districts; and nothing can be said against this practice, whose only disadvantage is that of expense.

It is obvious that where stone is plentiful and where bricks are scarce, there is no call to use the latter in general building operations, and *vice versa*.   Most stone districts give a choice of varieties of that material, and therefore it is to be recommended that one sort should be adopted for all the architectural features, while another, if possible

contrasting with it as regards colour, should be used for the wall spaces; a third variety, if to be had, may be introduced, either to accentuate the finishings, or in the shape of bands, relieving arches, &c., in the general wall-work. When one sort of stone is to be adopted for a building, there is a possibility of imparting considerable character and relief to it, by treating the stone-work of the wall surfaces in a manner totally dissimilar to that of the decorative portions. The most effective way of doing this, is to use small stones for the walls, built in irregular courses, either with pick-dressed or rough-pitched surfaces. In some parts of England, buildings have been, of late years, erected with light freestone finishings, and the general wall surfaces of a small grey rubble work composed of stones obtained in some districts of Yorkshire, and termed shoddies. When nicely treated, buildings executed in this manner have a very good effect, the rough nature of the pitch-faced shoddies giving a texture and effectually preventing monotony. The practice so prevalent in modern times of building throughout with polished freestone of one colour, has been injurious to architectural effect, being in fact little better, except on the score of honesty, than the cement-works perpetrated in imitation of it. Buildings of polished freestone are only rendered tolerable by having an abundance of mouldings, carvings, and the like, applied to them. We hold that a mode of building that is effective at a minimum cost, is that which should be adopted by us for the present day, so that whatever we do may be genuine, and that when we have funds at our disposal we may introduce some real art, either from the hands of the sculptor or painter, instead of spending it all in the mason's yard. In England, of late years, we have had too much of meretricious display in our buildings, and too little of that which is most likely to do us credit in years to come.

In this country, where stone-work has been found so liable to decay, it is advisable for the architect to adopt a class of ornament which, while it is highly effective, presents but little that the weather can affect to any serious degree. Much delicate carving in high relief is not to be recommended; and bold mouldings so designed as to throw off moisture as quickly as possible, and to prevent it running down the walls, are those which we should be careful to introduce in all possible cases. Great effect may be secured by associating with simple bold mouldings different kinds of notch, saw-tooth ornament, and the like, several specimens of which are to be found in our Plates of details. Valuable lessons in this simple and effective treatment of stone-work, may be learned from our own Norman and Scotch Baronial architecture, and the early Gothic

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of France. There is no doubt that of late years we have neglected to a great extent to develop design in stone-work, seeking rather extreme richness instead of effective simplicity; but fortunately our best architects have done much, and are doing much. to introduce a better feeling in this respect.

In the course of our remarks on Brick-work, we shall have to speak of Stone-work suitable for introduction along with that material.

ORNAMENTAL BRICK-WORK.

For a very long time that humble material, brick, was considered as ignoble and unworthy as it appeared unsuitable for first-class building operations. This idea is, however, by no means universal at the present time, and those who have been content and bold enough to adopt it where it was most readily to be obtained, and have thought it worthy of some careful consideration artistically, have been amply rewarded by the results.

Brick-work is capable of a most artistic and effective treatment, and if carefully handled, there is no necessity to regret its adoption. A few simple rules are all that are necessary in designing brick-work, and we shall endeavour to give them in the course of the following remarks.

One of the principal advantages of brick-work is the variety of colour it places at the disposal of the artist. It may be obtained of almost all shades of buff, grey, red, and of almost pure white, and black; and with these tints on the palette, he must be a poor artist indeed who cannot produce an effective composition. We must say, however, that for external work, white and buff bricks should be avoided, and stone used in their place. Besides the ordinary bricks there are others which can be obtained of almost any colour, having an enamelled surface; the greatest objection to these is, that they are glazed, and in bright light give a glittering effect, which is exceedingly unpleasant, and destroys that richness and depth which are characteristic of good brick-building. There are other materials which from their close alliance to brick are suitable for being used with it; we allude to the various kinds of ornamental tiles, but here again the difficulty of using them within the bounds of good taste renders them rather dangerous materials. Like the enamelled bricks already alluded to, all glazed tiles must be

eschewed for external decoration. In selecting tiles, care must be taken to have their patterns of the simplest and boldest kinds, such as plain lines, zig-zags, dots, &c., or their effect will be totally discordant with the patterns and bands of the brick-work, which must of necessity take definite sizes. For internal work both glazed and dead tiles may be adopted in bands, base-courses, and the lower portions of walls, where they are subjected to wear and tear. The ease with which glazed tiles are kept clean renders them valuable for the walls of halls, staircases, corridors, kitchens, &c., while their ornamental nature renders them suitable and effective for decorative purposes.

Besides the plain bricks of various colours mentioned above, there is another class, which when used with taste, and within proper bounds, adds considerably to the effect of a brick building. This class includes all bricks which are moulded. The most important rule to be observed in the adoption of moulded bricks is, that where true artistic results are desired, the simplest forms should be used. Brick-work of late years has been brought somewhat into disrepute among persons of taste by the lavish use of moulded brick, and what is of a similar nature, terra cotta.

It must be obvious that truly good brick-work should have, in the ordinary nature of things, a treatment peculiar to itself; and that in proportion as it is forced into what is correctly the province of another material it fails, and ceases to be worthy. In short, wherever brick-work is used to imitate or take the place of any other material, it looses the value which is readily accorded to it when kept within its proper bounds.

A brick, as it is usually understood, is a simple squared mass of burnt clay (measuring, say between 9 inches and $9\frac{1}{2}$ inches long, about $4\frac{1}{2}$ inches broad, and from $2\frac{1}{2}$ inches to $3\frac{1}{4}$ inches thick); and such being the case, the artist should take it as it is presented to him, and use it as far as possible without seeking to modify its shape. The result in his building operations will be a preponderance of sharp angles and square recesses, which in no small degree give to brick-work the character which distinguishes its treatment from that of good stone-work.

The application of brick in ornamental building is of necessity limited, and in all cases where stone-work is advisable it should be at once adopted.

The many endeavours that have been made to dispense with stone altogether in large and elaborate buildings, while they have shown great care and ingenuity, have proved expensive failures, architecturally speaking. There is no doubt that the study of Italian architecture has induced many to adopt a florid style of brick-work. In Italian

buildings of brick, the small proportion of stone used in their construction is remarkable. As a rule they are composed of red brick throughout, the general walls being built of an inferior kind of brick to that adopted for the ornamental portions, many of which are certainly of great beauty and delicacy. For illustrations and full description of the best specimens of Italian brick-work, we must refer our readers to Mr. Street's work, " Brick and Marble in the Middle Ages."

To make brick-work truly valuable for modern work, it is necessary to seek after that treatment which adopts the ordinary bricks, and those moulded forms which are most easily produced. Throughout all the designs in our work, we have purposely avoided everything that is florid and complex, seeking to make our designs suitable for erection by ordinary workmen, and with the most common materials. Although our details fully explain themselves, we may briefly state the principles on which they are designed. It will be observed that in almost all cases, angles, whether of the general walls, or of the doors, windows, &c., are left square, and may therefore be executed with ordinary shaped bricks. Chamfered, beaded, or otherwise moulded angles, unless most carefully executed with perfectly shaped bricks, are very objectionable, and when produced under the most favourable circumstances are rarely satisfactory, for one quickly recognizes that they are but imitations of a treatment proper to stone-work. Apart from this, the small size of the bricks used to form the mouldings and the number of joints necessary, destroy the continuous effect so agreeable in mouldings.

The introduction of chamfers on such angles as are liable to be damaged is both admissible and desirable, but chamfers in brick-work can rarely be used on the score of beauty. As a rule, ornamental patterns to be produced by moulded bricks should be of a simple character, and should be of such a class that each member may be formed of a simple brick. In all our designs we have adhered to this rule.

As large flat masses of brick-work are unavoidable characteristics of building in that material, and as these are liable to become monotonous, resort has to be made to some means of relieving these wall spaces. Italian architecture has given us the idea for the best way of doing this; and although in it the effect sought for is produced by bands, &c., of coloured marbles, we are not at a loss to discover that similar results, though of course in a modified degree, may be obtained by the adoption of bands, &c., of bricks of a different colour from those forming the body of the walls. Our designs will fully illustrate these remarks.

Of all colours of brick, red is decidedly the most to be recommended for walls. White or buff bricks, though much used, are not suitable for our climate, which rapidly changes their colour to a dingy hue, and the similarity of their colour to that of stone prevents the effect produced by the introduction of that material in red walls from being secured. White brick building, banded or otherwise varied with black or red bricks, are very unsatisfactory, and indeed the same holds good when white bricks are freely used in red walls, though not to the same extent. Red brick-work relieved with dead black brick, and associated with buff stone in those portions which cannot be readily executed in brick-work, and sparingly in bands and such like, has the most satisfactory effect that can be secured in this class of building.

Another pleasing style of work may be produced by using ordinary slop grey brick for the general walls, and adopting bright red and dead black pressed bricks for bands, arches, cornices, and the like. In this class of work the angles of the walls, windows, and door openings, &c., should be formed of the ordinary grey brick, and in no case should quoin work of red or black pressed brick be introduced. This objectionable practice is, however, very common, and is probably caused by a desire to have such angles moulded, and with the impression that square angles are to be avoided.

Band work, in red pressed brick walls, should be defined by a course of black brick on each side, between which a plain or ornamental stone course may be inserted, or a plain band of red brick, or an ornamental pattern formed of red and black bricks. These pattern bands should in almost all cases be composed of ordinary-sized bricks, placed header and stretcher as the design may dictate. The simpler these designs are kept, the better they are.

Band work in grey brick walls may either be margined with a course of red or black bricks; but where a single black line of one or two courses is introduced, it should invariably have a red course on each side of it to give it richness, and connect it better, optically, with the grey wall. It is advisable to execute all arches, except flush relieving ones, with red and black bricks, margining them on the outside by a course of black; and where tympani occur they should likewise be of pressed brick. This treatment is shewn in the dormer windows on Plate 85, and in the brick designs throughout the book.

In the construction of string courses and cornices, the upper course should invariably be of stone, the brackets, &c., under, may be of plain and moulded bricks, built projecting from the walls. On Plate 85 we give details of cornices formed on this principle.

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Brick-work may be finished in several ways as far as the joints are concerned, but the most effective is that commonly called tuck pointing, viz., a narrow raised joint of white lime. When this class of work is adopted, the wall surfaces should have both horizontal and vertical joints clearly marked, but all continuous courses of bricks belonging to the bands, should have horizontal joints only, tuck pointed. The vertical joints being flush pointed with red or black coloured mortar, as the case may require, of course all pattern work between the continuous courses should be pointed both horizontally and vertically in such a way as best to develop the design.

WOOD-WORK.

Continuing our remarks on the principal building materials, we have now to say a few words in connection with wood-work. The most important rule to be observed in designing wood-work for building purposes is, that the material should be used in such a way as to develop its peculiar properties, and all construction necessary should be undisguised and honest. Simple as this rule may appear, it is surprising how little it is observed, and how great a reformation it would work in joinery were it always conscientiously followed.

The modern Gothic School in England, deserves the greatest possible credit for what it has done to revive a true treatment of wood-work, which during the last two hundred years had been the favourite material in which to perpetrate all conceivable inconsistencies and abortions.

The most favourite idea of the architects of the charming epoch just passed, was to make wood-work represent anything but what it really was. Massive columns, arches, and the like, designed in correct proportion, and redolent with rich marbling, or more unpretentious sanded paint, had to do duty for real marble or stone-work, to betray itself in a painful manner when the clumsy construction became apparent by fissures unnatural in either of those materials. This, however, putty and paint fortunately could remedy.

A good piece of architectural wood-work should be simple and bold, designed without any apparent effort, and should have its construction decorated in the simplest and most

effective manner, with due attention to the nature of the material. When the higher class woods are used, but little ornament should be indulged in; and plain surfaces should be left undisturbed so as to show the natural beauty of the material. Carving, as a rule, is not to be recommended in wood-work, but when used, should be so very sparingly. The modern style of wood carving, with its careful finish and sand-papered roundness, cannot be too much condemned. The true system is that observed in early Gothic work, where we see the decided touch of the tool left just as the artist finished it. Wood carving also should shew in its every line that it is wrought from a fibrous material, and not have the appearance of smooth cast work. Mouldings should not be lavishly used, and where possible should be worked from the solid constructional portions, and not stuck on. If this were followed, it would prevent the over use of mouldings, and materially add to the durability of all constructions.

It should be the endeavour of all workers in wood to secure simplicity of construction, and to obtain effect at the least possible expense of labour. Nothing can be gained either by complex or concealed construction; and excessive richness of detail, unless it be the production of a first-class artist, is almost certain to display strong indications of ignorance and vulgarity. Simple beauty is always better than elaborate ugliness. As carving is not to be recommended in wood-work, some other sort of decoration besides that supplied by painting is desirable, and inlaying can be very appropriately used for this purpose. Inlaying may be practised from the simplest treatment, which consists of insertions of dots, lines, frets, zigzags, and such simple geometrical patterns, to the most elaborate rendering of conventional foliage designs or figure subjects. Parquetry, which is now frequently used for flooring, need not, however, be confined to that purpose, its great beauty and durability making it a very suitable material for filling in panel work on walls, ceilings, &c.

It is to be regretted that wooden ceilings are not more common for apartments of dwelling-houses—they are infinitely more durable and beautiful, let them be as simple as they can be made, than the most elaborate productions in plaster. Wood ceilings can be tastefully decorated with colour on the mouldings of the beams and on the panels, when they are not filled with designs in parquetry. Of course all the beams shewn in a timber ceiling should be the proper bearing construction of the floor over, and the flooring boards may have their under sides dressed and displayed, or they may be covered by panel work belonging to the ceiling; the latter mode is perhaps to be recommended, as it permits the floor being deafened.

DECORATION.

In this the concluding portion of our Essay, we propose offering a few hints relative to the decoration of the interior of dwelling-houses. With the exception of several of the mansions and houses of the wealthy, and perhaps a few isolated examples of more humble character, few of our dwellings have of late years presented any indication of taste in their decoration. The practice of leaving all to the mercy of the house-painter, whose ideas seldom soar above grained wood-work, marbled walls, vulgar wall papers, and a lavish use of gold leaf, has done much to corrupt public taste and check development in this direction.

It must be obvious that the internal effect of a house depends as much upon the skill displayed by its decorator as upon the talent shewn by its architect, and the best labours of the latter are more often nullified than otherwise by the crude ideas and awkward ignorance of the former. A poorly designed house may as easily be made to look passable, or even well, by a tasteful system of decoration, as a thoroughly good architectural design may be destroyed by tasteless decoration: but how little this fact appears to be understood! Why is the architect not employed to decorate his buildings? surely he is of all persons the most proper man to be employed. It may be safely surmised, that until such a practice becomes common, and until architects educate themselves as thoroughly in decorative art as they do in architecture, one will see but few of those results which must have been so common in those early ages when architecture and the decorative arts were so closely allied that the architect and artist were one person.

The intense love for graining and marbling which appears to have taken hold of the majority of persons, has done very much to bring house decoration to such a state that it can scarcely be considered to be within the realms of art. A house with its lobby walls painted to imitate some light marble, its doors and the other wood-work grained in imitation of different woods, its walls papered with fashionable French floral papers, its ceilings whitewashed and its cornices tinted, even in the present day, would be considered by ninety-nine persons out of the hundred to be perfectly satisfactory, if not indeed beautiful.

As it is quite impossible for us to go fully into the subject of the decoration of dwelling-houses in this place, or to do it any justice without copious coloured illustrations,

we must be content by briefly pointing out the general system which should be adopted to insure success.

In Gothic houses of any pretensions built in the present day, the wood finishings are usually executed in oak or pitch pine, and of course, no paint is applied, French polish and varnish only being used to protect and develop the beauty of the materials; but in small and less costly houses yellow pine is the usual material. Although it is not an unusual thing to see yellow pine varnished, it is scarcely to be recommended on the score of beauty; for if good, it is without figure or markings of any kind, and is therefore exceedingly tame and poor looking; however, by a slight introduction of colour, varnished pine may be made a very passable material, and infinitely better than the best grained imitation of more precious woods. The best way of applying the colour is to draw the mouldings in with lines or simple stencilled ornaments in quiet colours; such as sage greens, chocolates, maroons, dark blue, white, &c., and to ornament the large flat surfaces, such as the panels of the doors, &c., with neat sprays or quaint foliage designs, stencilled or hand painted in similar quiet colours. This painting should be done on the wood-work before the varnishing is commenced. With taste and care a house finished in yellow pine throughout may be made very characteristic and beautiful. Colour may be applied in a similar way to oak and pitch pine, with great advantage in every way; but they are almost independent of it, as they are naturally beautifully marked. In houses of other styles, a precisely similar mode of procedure may be observed, the style of the painting being kept in harmony with the style of the architecture. It is only since the revival of Gothic art that polished and varnished wood-work has become, comparatively speaking, common, and now almost invariably the wood-work in houses of all other styles is painted. There is no possible objection to this practice if the painting is done in proper taste, and if the thoroughly bad practice of graining is abandoned. Wood-work painted in flat tints of several tones, hatched up with lines or simple ornaments of some effective harmonizing colours, and a little gilding, if properly done, never fails to be more beautiful and satisfactory than the most cunning specimen of graining, while it has the advantage of being artistic, which the purely imitative processes have not. In one case colour is applied for its own value and beauty; in the other, it is only used to cover up an inferior material to that which it is intended to represent. In painting, as in other arts, honesty is the best policy, and shams are to be avoided.

In painting plaster walls, such as those of lobbies, staircases, and the like, a desire to

make them look like stone or marble should be avoided. They should be coloured some uniform tint, where expense is an object, and decorated in various degrees, if richness and beauty is desired. There are several ways of treating walls; they may be covered all over with open diaper patterns, or they may have their lower portions painted some rich flat tint, plain or powdered with ornamental figures, having a border along the upper edge, and their upper parts either of a light plain tint or covered with a diaper, or a vertical treatment of floral ornament, springing from the border. When we recommend a floral enrichment, we allude to a strict conventional treatment of leaves and flowers, and not to any natural representations, which are to be condemned in decorative art.

Nothing need be advanced against the practice of covering the walls of rooms with ornamental papers, allowing that the papers are chosen with due regard to their correctness. All flat geometrical patterns or conventional renderings of flowers and foliage, if well designed and properly coloured, are perfectly suitable for walls.

Cornices should be boldly treated with colours harmonizing with those of the walls underneath, and so arranged as to have the effect of softening off the colours of the walls into the tint of the ceiling above. Gold should be sparingly used in the ornamentation of cornices; indeed it should be sparingly used in house decoration generally, as a free use of it never fails to destroy repose and to impart a vulgar, glittering effect. Gold should never occur in masses; but such things as lines dividing colours, small stencil ornaments on dark grounds, margins to foliage, and such like, are those for which gold is generally suitable.

Ceilings may be treated in various ways, but the simplest are invariably the most satisfactory. Timber ceilings require only to be relieved by colour on their beams, and to have some neat device stencilled or otherwise painted on their panels when the latter are not in ornamental wood-work. Plaster ceilings in dwelling-houses require, especially when gas is used, to be so frequently cleaned, that any other mode of treating them, save by flat tints (chosen to harmonize with the prevailing colour of the walls), proves inexpedient and expensive. Simple lines, with corner devices in colours drawn round a ceiling, have a pleasing effect without being expensive.

With these few hints relative to the decoration of dwellings we close our Essay, trusting that what we have said may not be uninteresting to our readers.
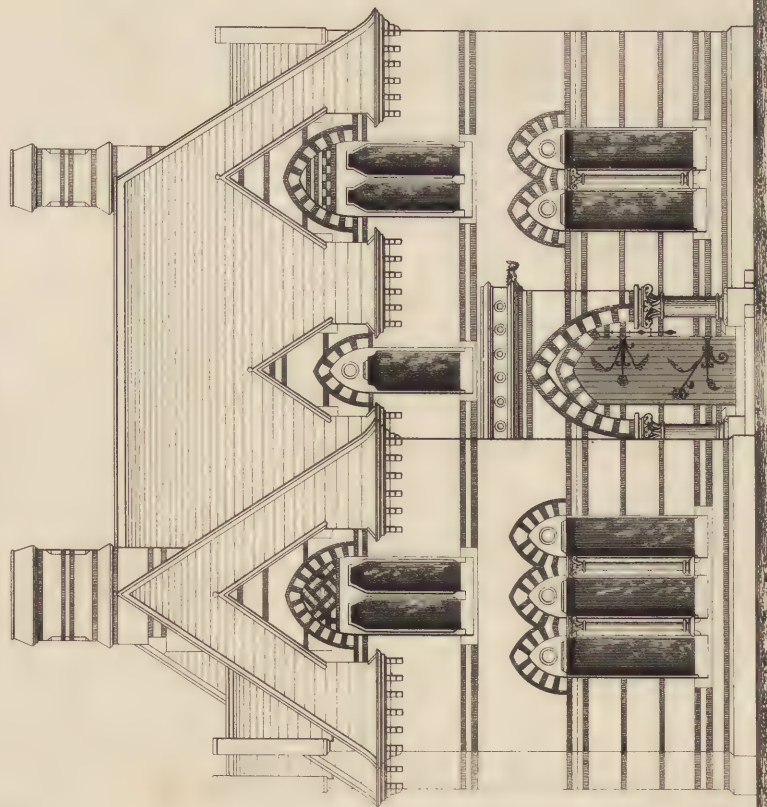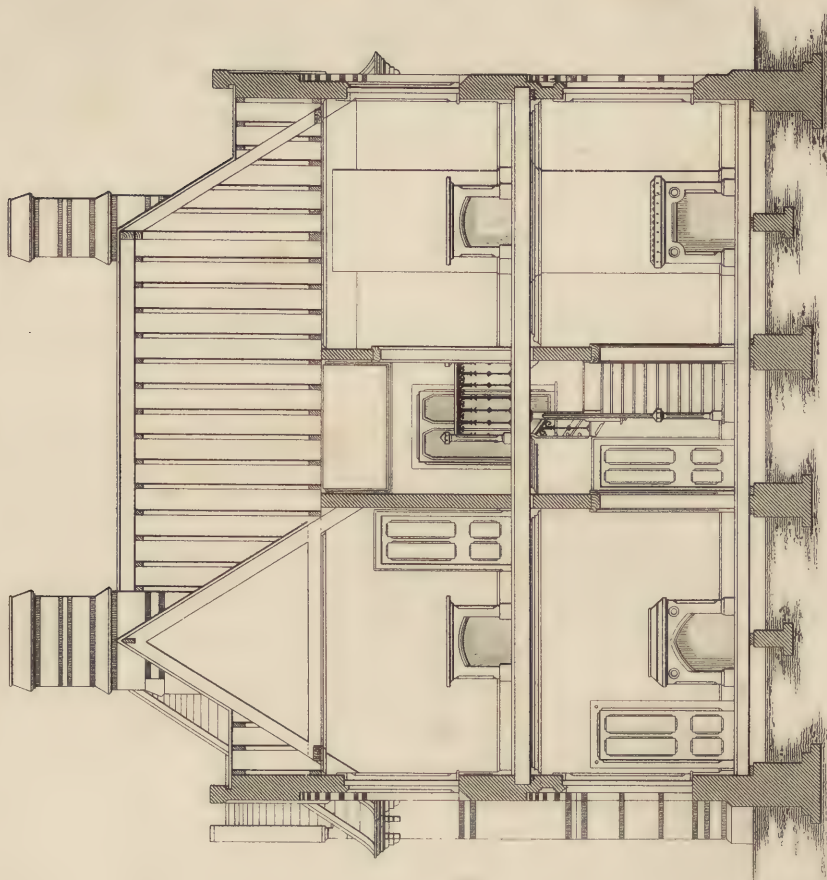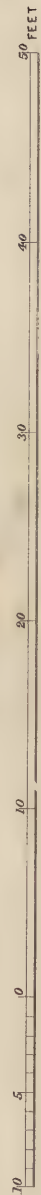
SECTION at A.B.

FRONT ELEVATION

10   5   0   5   10   20   30   40   50 FEET

BEDROOM PLAN

COALS

ASHES

PRIVY

COURT

PANTRY

SCULLERY
10' × 8'-6"

KITCHEN
16' × 13'

PANTRY

PARLOR
15' × 13'

VESTIBULE

PARLOR
15'-3" × 14'-0"

PORCH

GROUND PLAN

BEDROOM
10'-3" × 10'-0"

W.C.

BEDROOM
13' × 12'-3"

LANDING

BED-ROOM
15' × 13'-4"

CLOSET

BEDROOM
15'-3" × 14'-0"

A

B

50 FEET
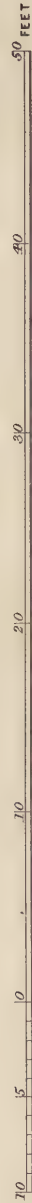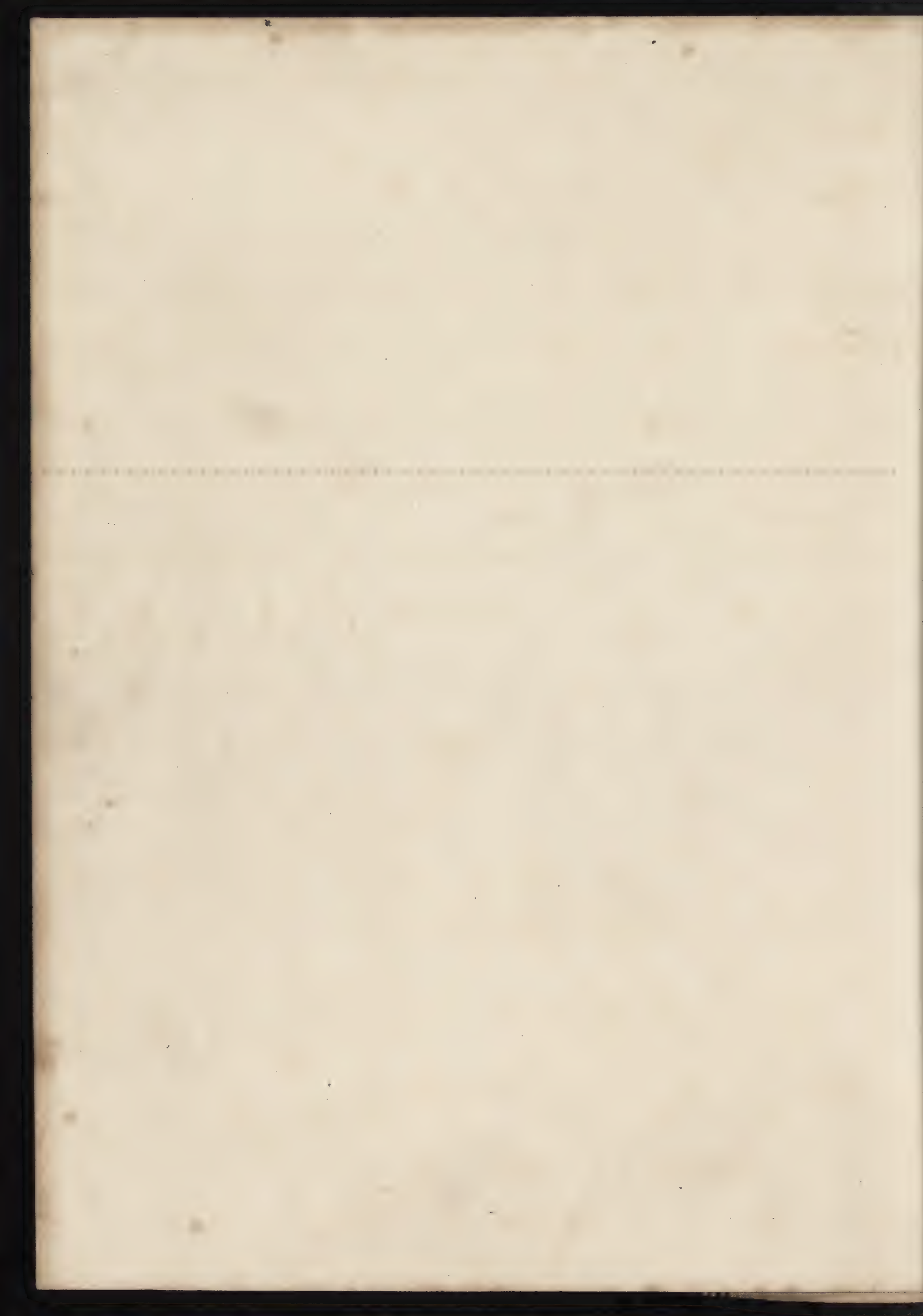
DETAILS.

DORMER WINDOW
OVER PORCH.
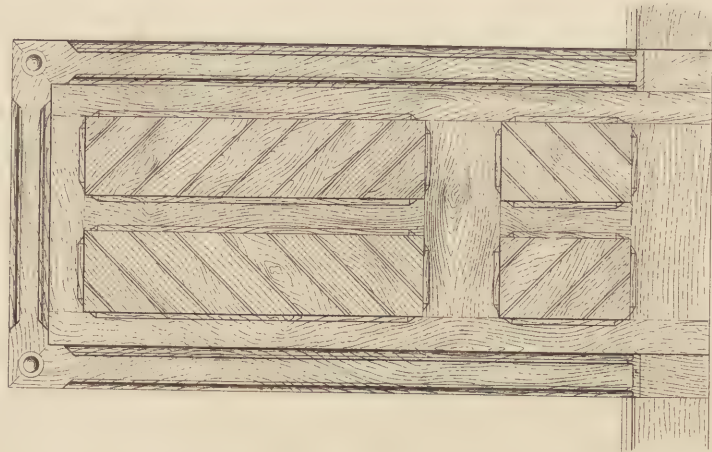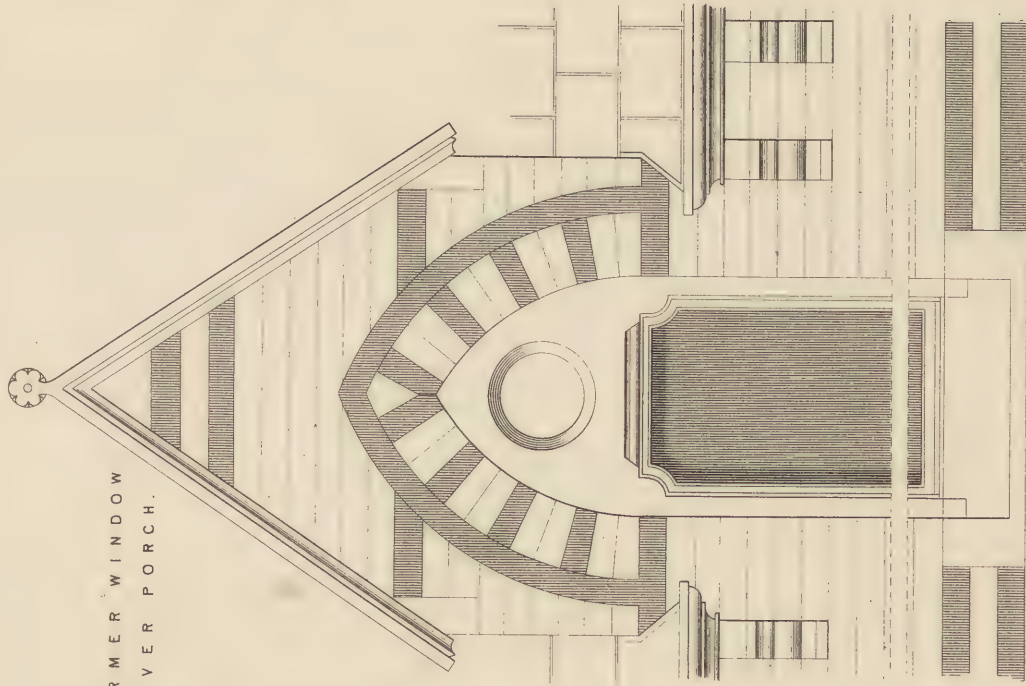
PARLOUR DOORS

PARLOUR WINDOW.

INS 12 6 0 1 2 3 4 5 6 7 8 9 10 FEET
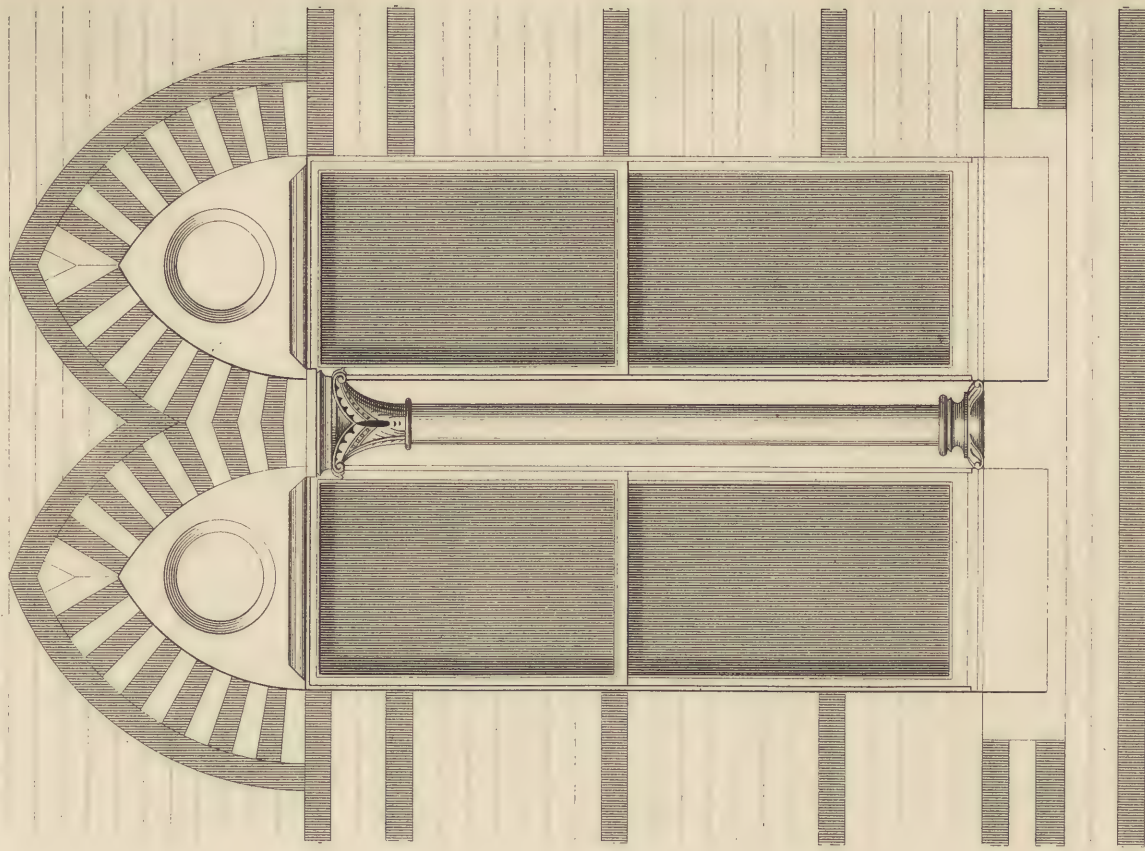
WILLIAM MACKENZIE, GLASGOW, EDINBURGH & LONDON.
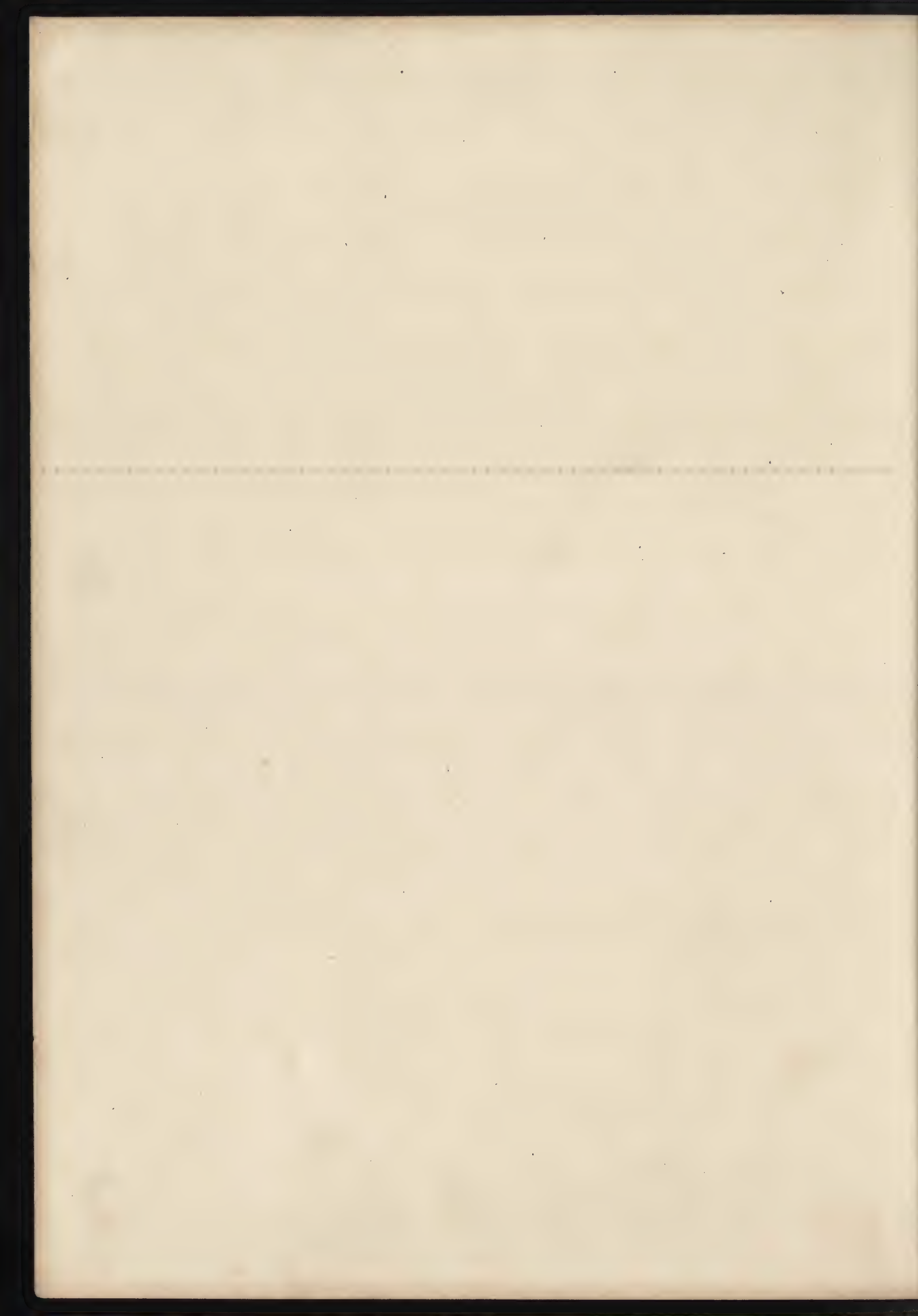
CHIMNEY PIECE.

CHIMNEY PIECE.

FRONT ENTRANCE PORCH.

INS 12 6 0 1 2 3 4 5 6 7 8 9 10 FEET

PLATES $\frac{A}{1}$ — $\frac{A}{2}$.

DESIGN FOR A GOTHIC LODGE.

PLATES $\frac{A}{1}$ — $\frac{A}{2}$ shew Ground Plan, Bedroom Plan, Front Elevation, and Section of a lodge or small cottage in the Gothic Style.

The design is shewn in the drawings to be built almost entirely of brick, stone being used only in the weathering of the base course, the steps, the bases and capitals of the columns of entrance porch, the pierced parapet of same, the cills, mullions, and tympani of the windows, the factables of dormers, and the weatherings and capings of the chimneys.

The whole of the walls, arches, and tympani of the dormer windows, are shewn to be built of brick of two colours, *i.e.*, red and black. The shaded portions in the Elevations representing the black brick.

The details of the brickwork of this design are shewn in the Plates devoted to the illustration of Ornamental Brickwork.

For directions regarding the proper treatment of brickwork, we must refer our readers to our introductory essay.

The main cornice is to be constructed of brick as shewn, supporting the moulded iron gutters.

The columns of the entrance porch should be of polished granite, or durable marble.

The whole of the roofs should be covered with green slates, which harmonize well with red brick; but bands of blue slates may be introduced with rich effect.

The windows may either be fitted with sashes and plate glass, or filled with ornamental leaded glass.

GROUND PLAN.—On the Ground Floor are two parlours, kitchen, scullery, two pantries, and the necessary offices. Along with these are supplied an open entrance porch, vestibule, and staircase.

The parlours measure respectively 15 feet 3 inches by 14 feet, and 15 feet by 13 feet; both are well lighted by several windows. The kitchen measures 16 feet by

13 feet. The scullery is 10 feet by 8 feet 6 inches, and is fitted with a sink. A convenient pantry or larder opens off the back lobby, and a small china closet or pantry is supplied underneath the stairs.

The vestibule is 7 feet wide.

A coal-house, ashpit, and privy are provided in the court.

The height of the Ground Floor is 10 feet 6 inches.

BEDROOM PLAN.—On the Bedroom Floor there are four good bedrooms, a closet, and a watercloset. The bedrooms measure respectively 15 feet 3 inches by 14 feet, 15 feet by 13 feet 4 inches, 13 feet by 12 feet 3 inches, and 10 feet 3 inches by 10 feet. All are well lighted and supplied with fireplaces. The closet which is 7 feet square, will serve as a small bath-room if required.

The height of the Bedroom Floor is 10 feet.

The Section is cut on the line A—B through the two parlours and vestibule on the Ground Floor, and through the respective bedrooms over, and the landing of the stairs. The staircase and its window are shewn in the centre of the Section.
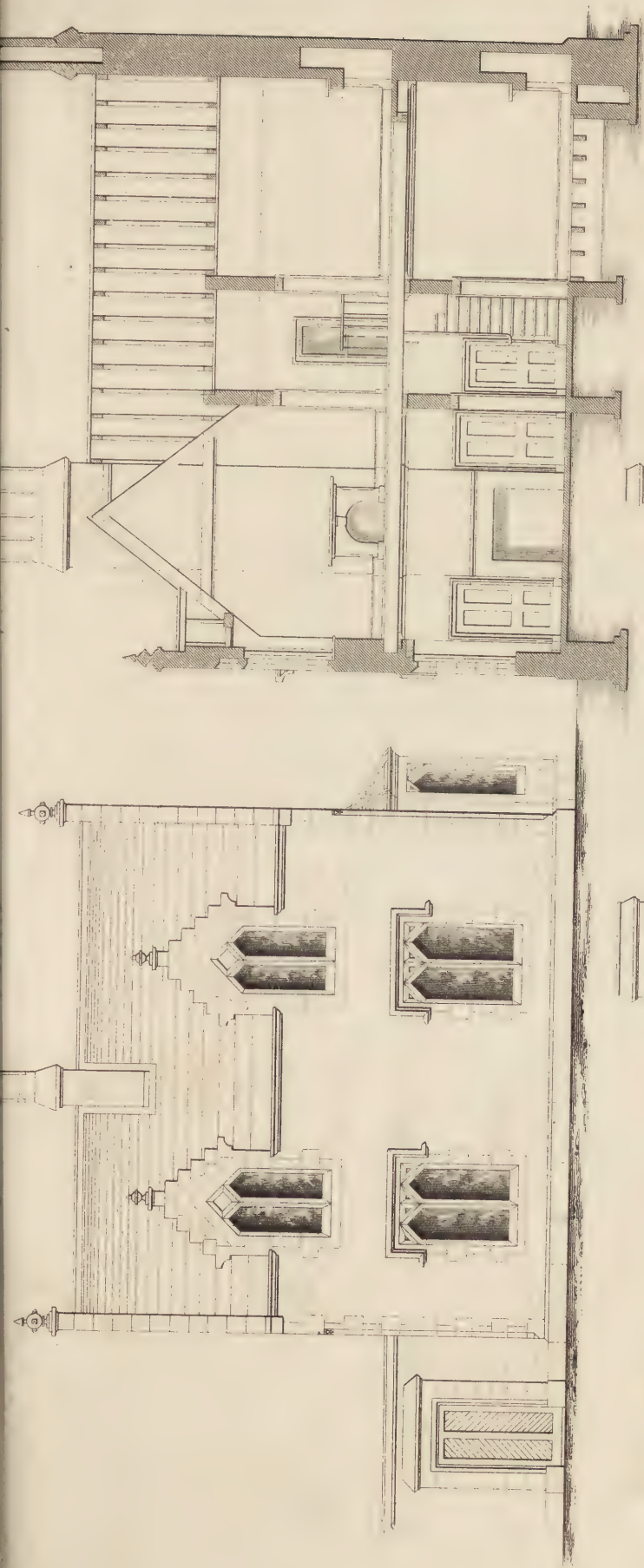
SECTION AT A B
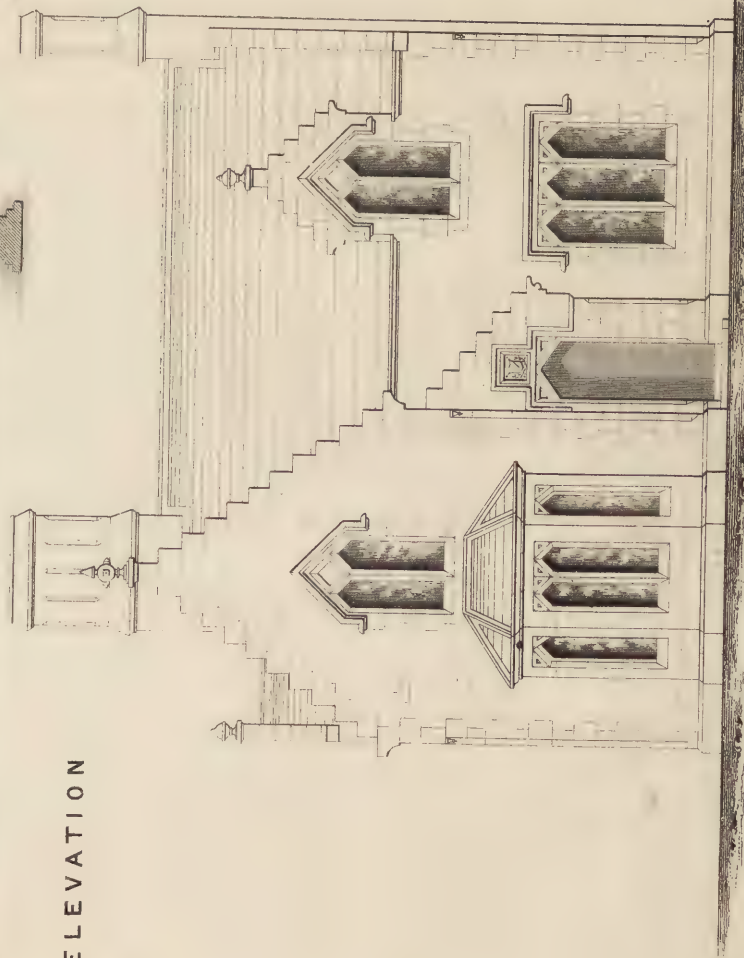
SIDE ELEVATION

WILLIAM MACKENZIE GLASGOW EDINBURGH & LONDON

10   5   0   10   20   30 FEET

BEDROOM PLAN

BEDROOM
15 × 12

LANDING

CLOSET

BEDROOM
14 × 12 3

BEDROOM
15 × 14

B

A

B

A

GROUND PLAN

PRIVY

ASHES

COALS

COURT

SINK

SCULLERY
12 3 × 9 3

PARLOR
15 × 12

STAIR

LOBBY

PANTRY

KITCHEN
15 × 14

PORCH

10   5   0   0   10   20   30 FEET
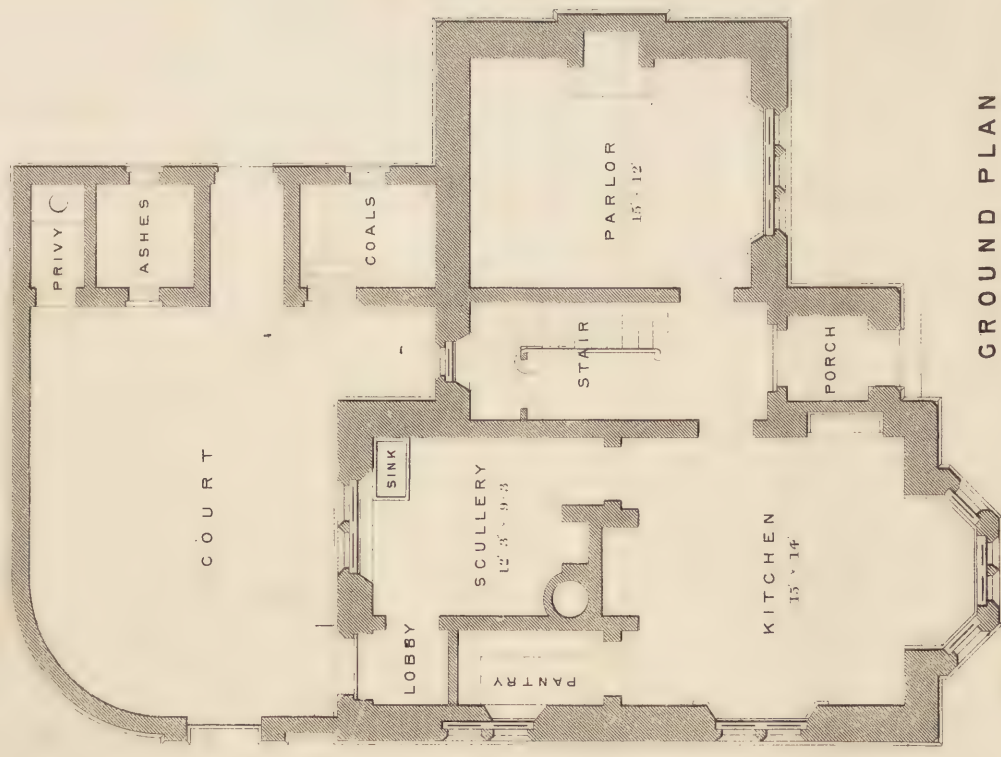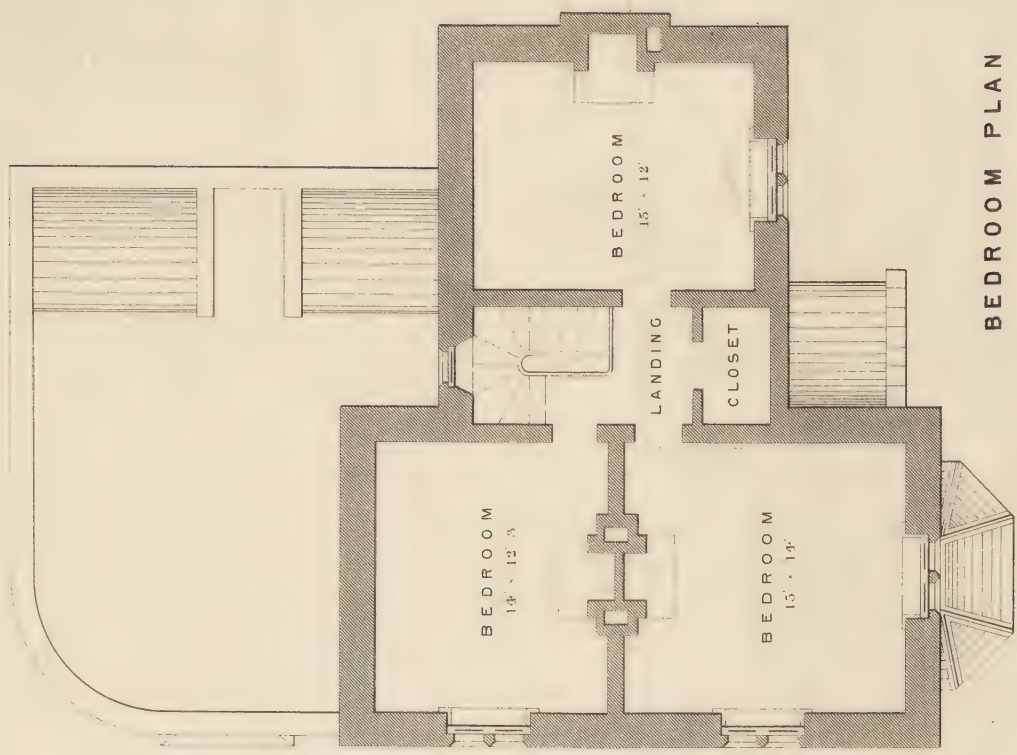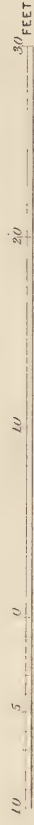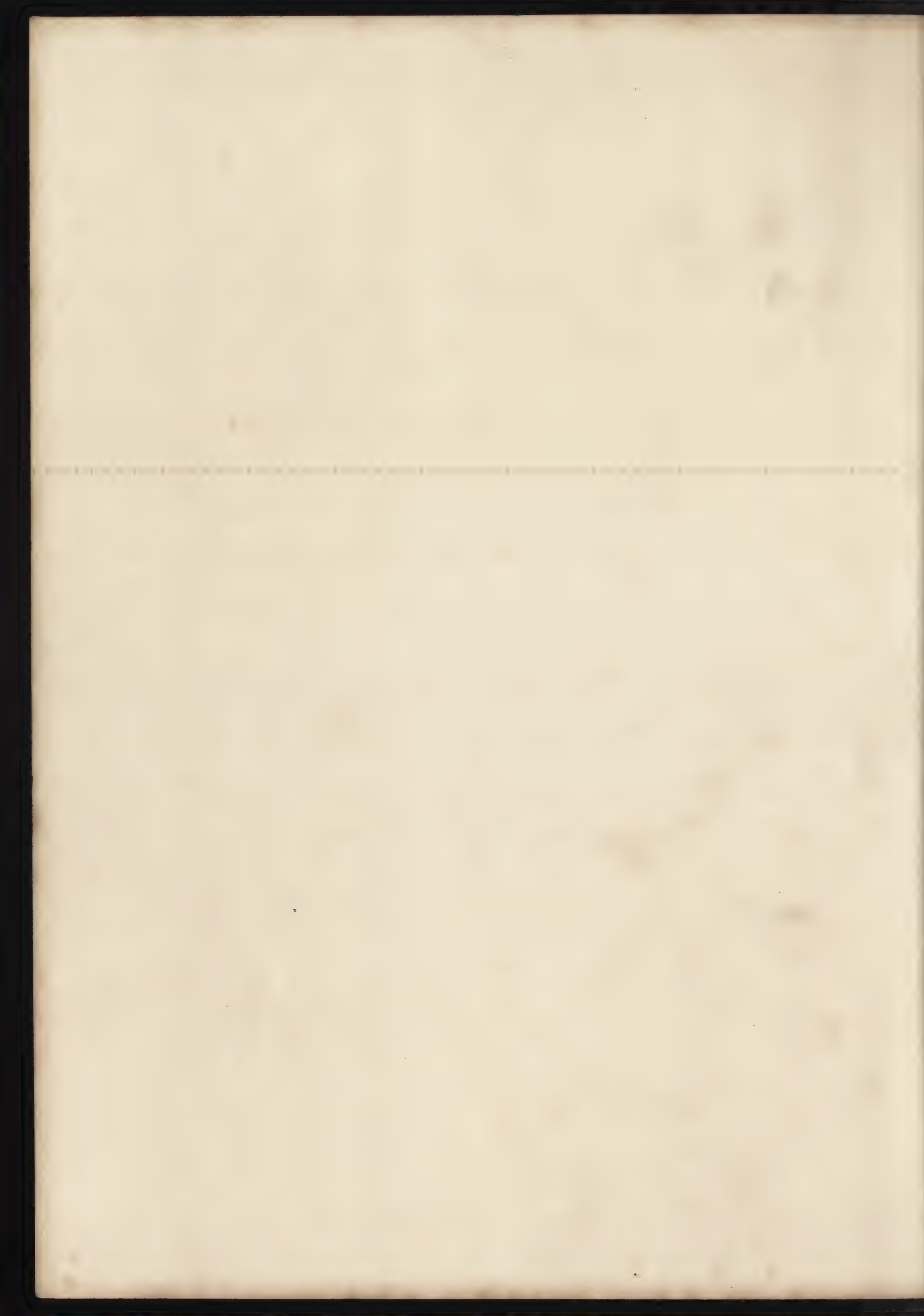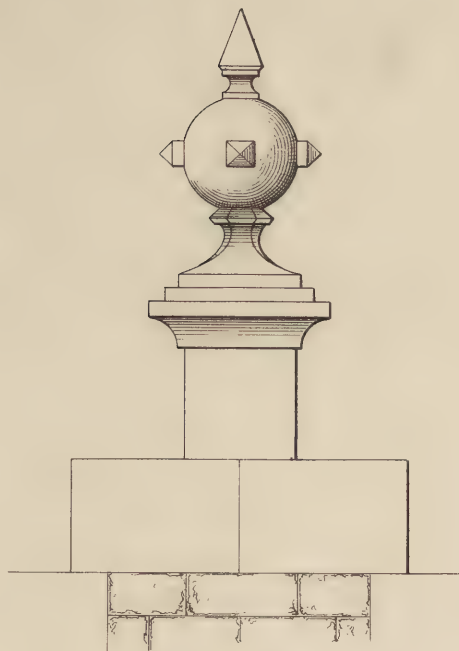
CORNICE OF BOW WINDOW

APEX OF GABLES
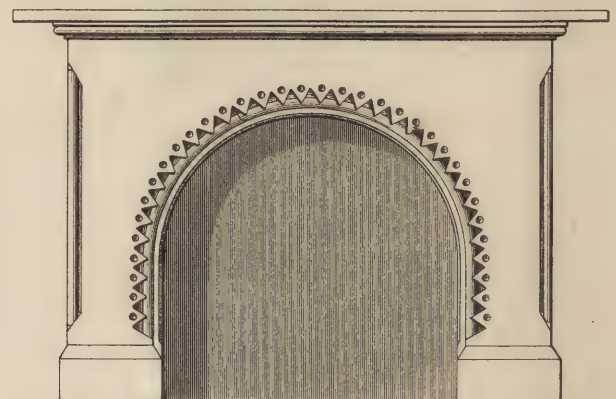
PARLOUR MANTEL PIECE
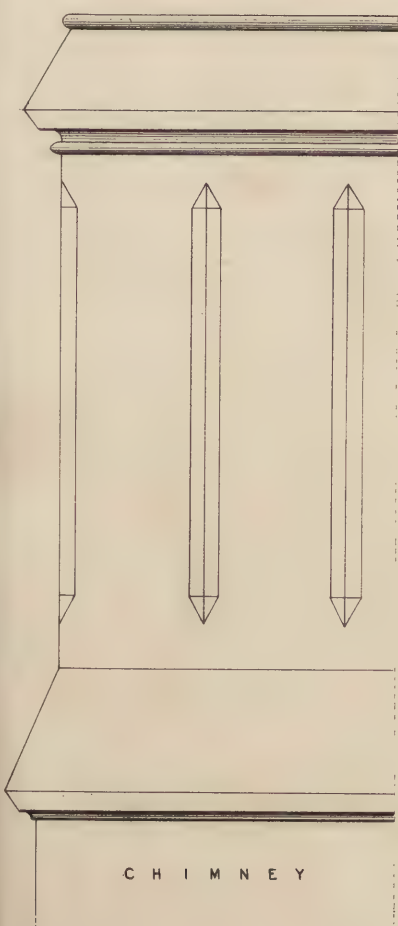
CHIMNEY

PARLOUR WINDOW

INS 12 6 0 1 2 3 4 5 6 7 FEET
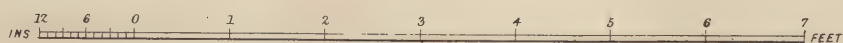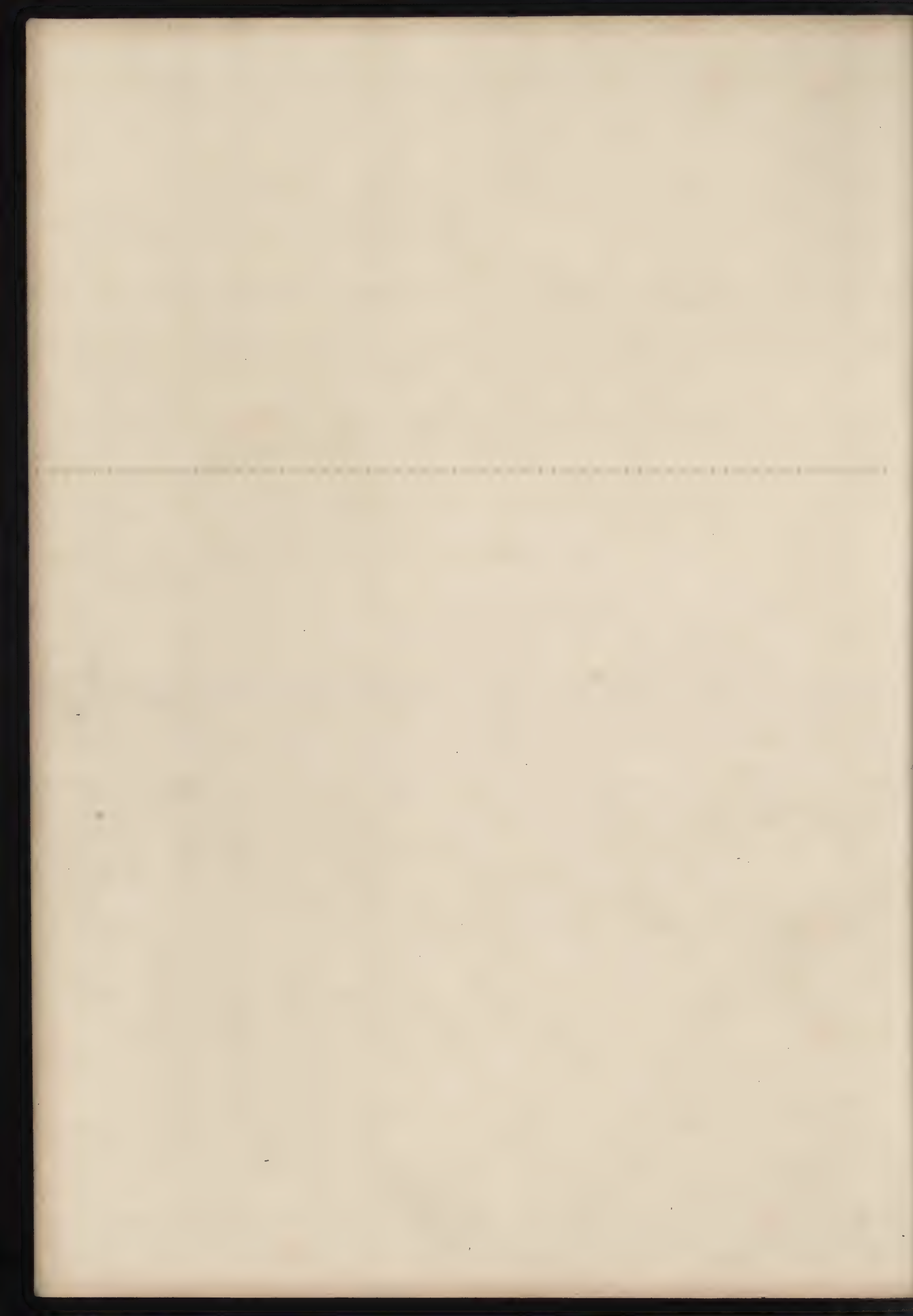
DETAILS

SPUR STONE

PLASTER CORNICE IN
PARLOUR
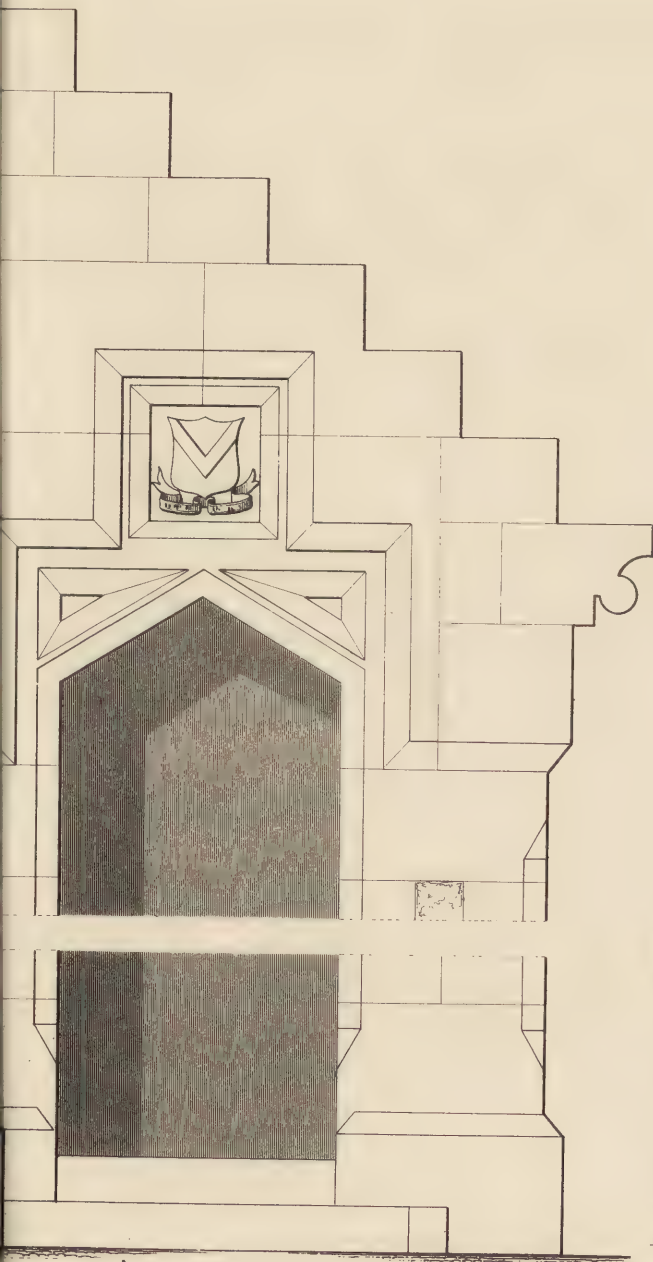
PORCH DOORWAY
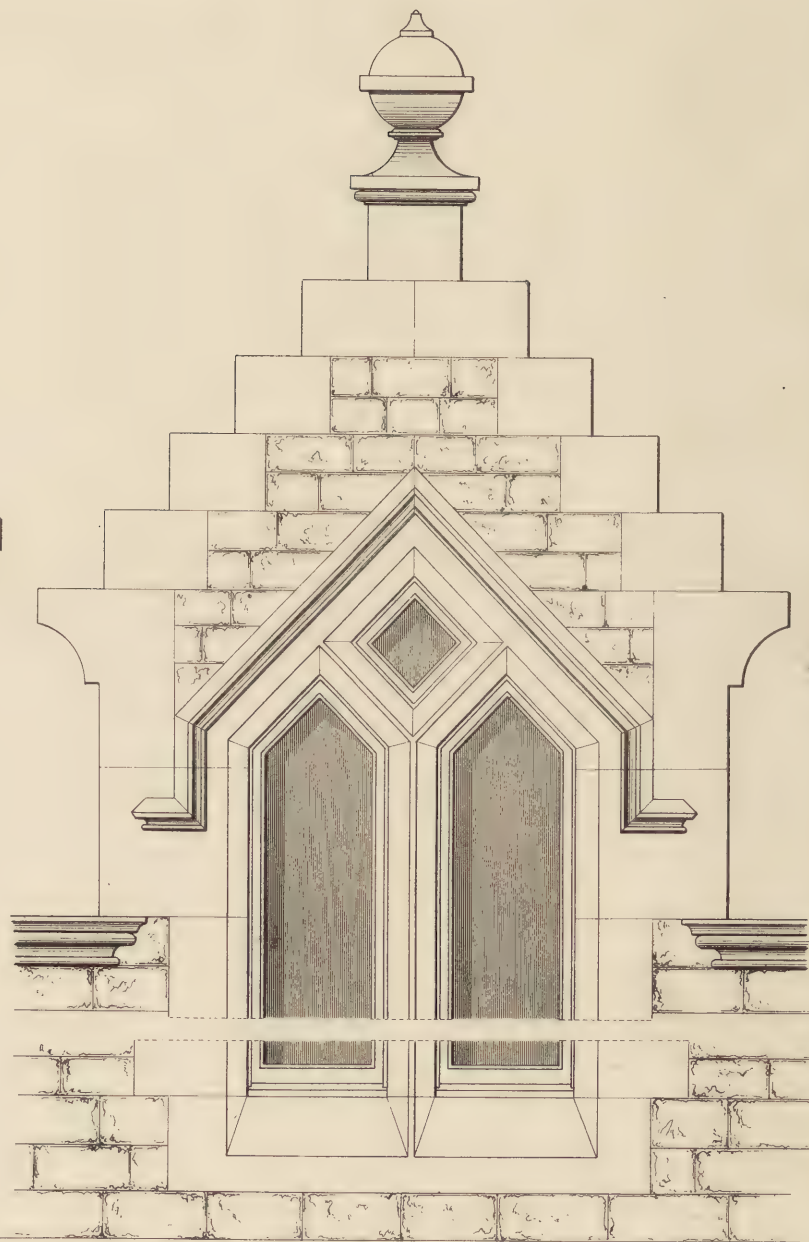
FRONT BEDROOM WINDOW

INS |‖‖‖‖‖| 12 6 0 1 2 3 4 5 6 7 FEET

PLATES $\frac{B}{1}$ — $\frac{B}{2}$.

DESIGN FOR AN ENTRANCE LODGE.

PLATES $\frac{B}{1}$ — $\frac{B}{2}$ contain Ground Plan, Bedroom Plan, Front Elevation, Side Elevation, and Section of an Entrance Lodge designed in the Old Scotch style. It is of an ornamental though not elaborate character, its details being effective and simple throughout. The general walls are shewn to be built of rubble; with the base course, door steps, quoins, finishings of doors and windows, crow steps, gable terminals, and chimney heads of dressed stone. The walls may, however, be built of red brick, with stone finishings, as above enumerated. The roofs to be covered with plain slates; and the windows to be filled with plate glass in sashes, or with diamond leaded glass, as preferred. The latter would have the best appearance in the present design. The panel placed over the archway in the front porch is for the reception of the arms or monogram of the proprietor.

GROUND PLAN.—The Ground Floor contains a parlor, kitchen, scullery, and pantry, conveniently arranged.

The parlor measures 15 feet by 12 feet, and is lighted by a large three-light window: the kitchen measures 15 feet by 14 feet, exclusive of its bay window. The kitchen in this design would of course serve as a general living room: it has attached to it a large cupboard and pantry; and off it opens the back kitchen or scullery, fitted with a fireplace, boiler, and sink complete.

The entrance door, which is protected by the small open porch, opens into the front lobby, from which the stairs to the Bedroom Floor start. The lobby is 6 feet 4 inches wide, and the stairs are 2 feet 8 inches. They are both lighted by a window shewn opposite the entrance door.

A coal-house, ash-pit, and privy are provided in outbuildings in the court.

The height of the Ground Floor is 10 feet.

BEDROOM PLAN.—On the Bedroom Floor there are three good rooms and a small lumber closet: all of which open off the landing at the head of the stairs. The bed-

rooms measure respectively 15 feet by 14 feet, 14 feet by 12 feet 3 inches, and 15 feet by 12 feet. All are well lighted and have fireplaces.

The height of the Bedroom Floor is 10 feet 6 inches.

The Section on the line A—B cuts the kitchen, lobby, and parlor on the Ground Floor, and the bedrooms over those apartments on the Upper Floor.

ITALIAN VILLA

SOUTH ELEVATION

5 · 0 · 10 · 20 · 30 · 40 · 50 FEET

PLATE C 2

ITALIAN VILLA
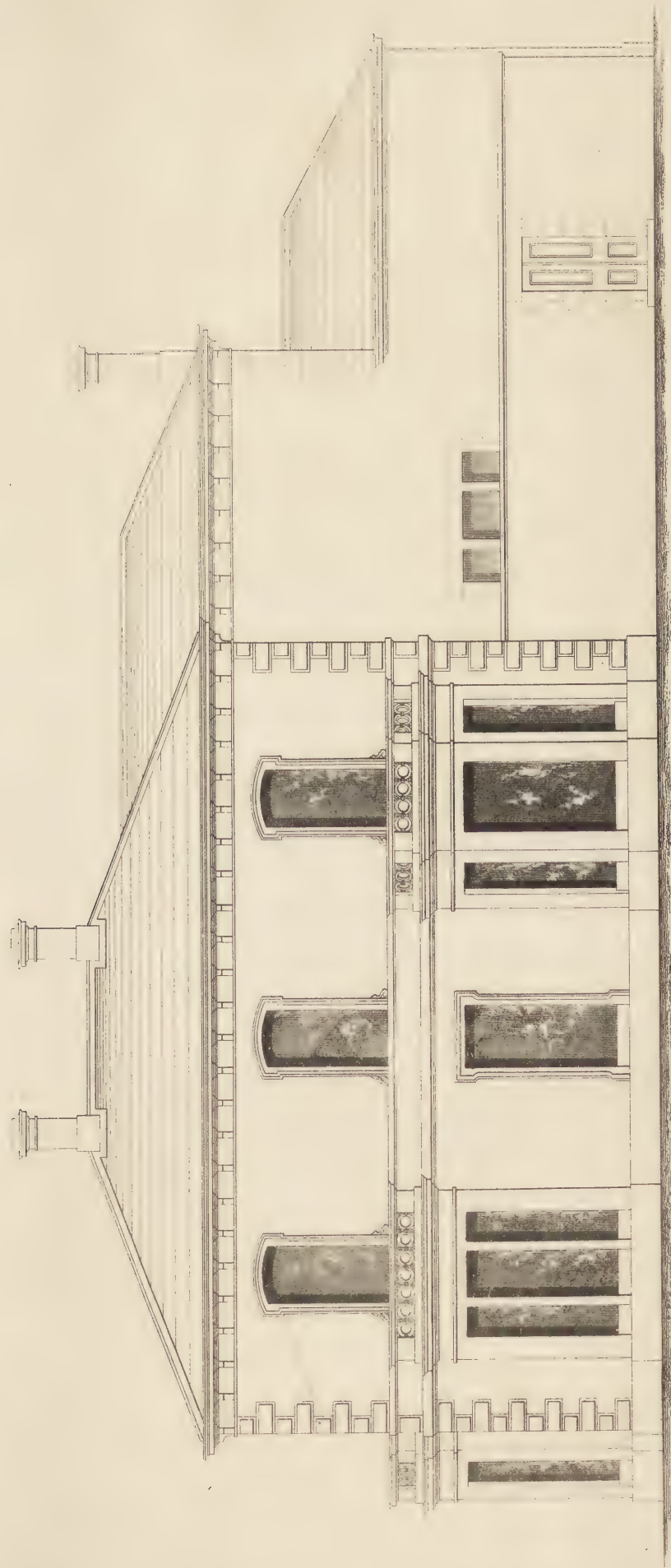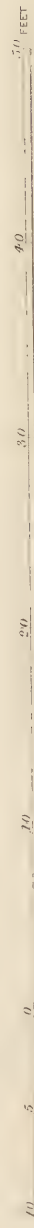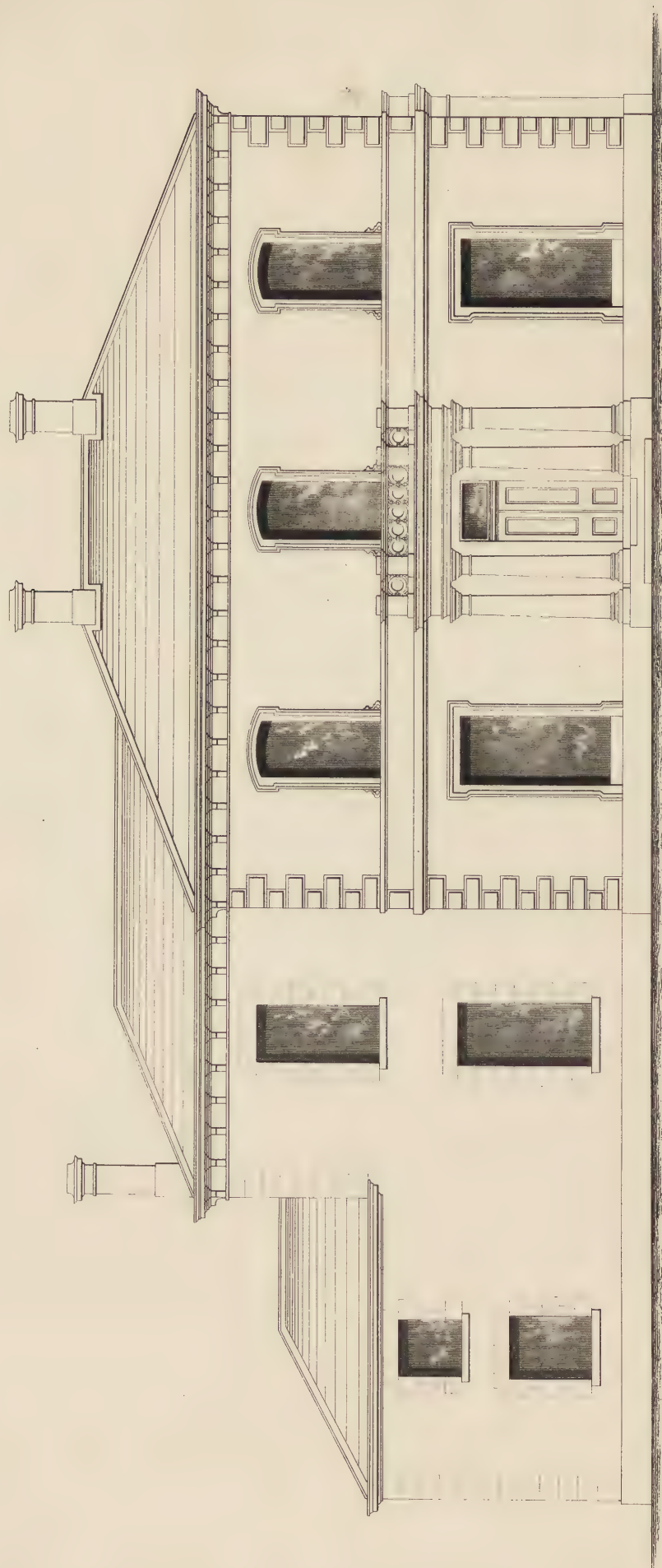
NORTH ELEVATION

BEDROOM PLAN

SERV^TS BEDROOM
17'-6" × 12'-6"

BEDROOM
13 × 15

BEDROOM
16'-0" × 12'-6"

BEDROOM
16 × 16

PASSAGE

LINEN CLOSET

HOUSEMAID'S CLOSET

BATH ROOM & W.C.
11'-0" × 10'-0"

LANDING

BEDROOM
16'-6" × 16'-0"

BEDROOM
20 × 16

B

A
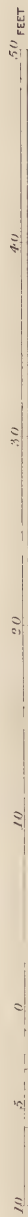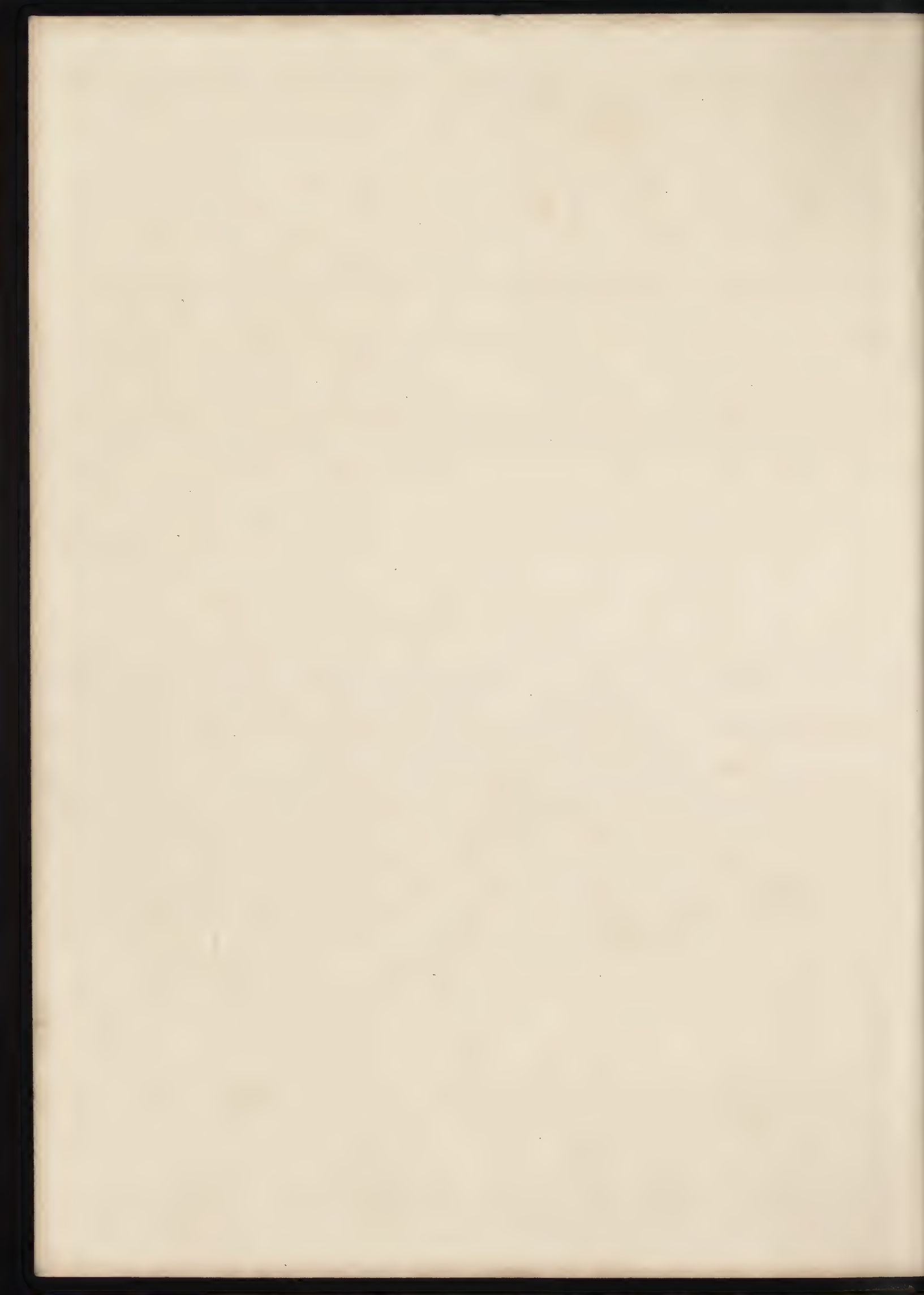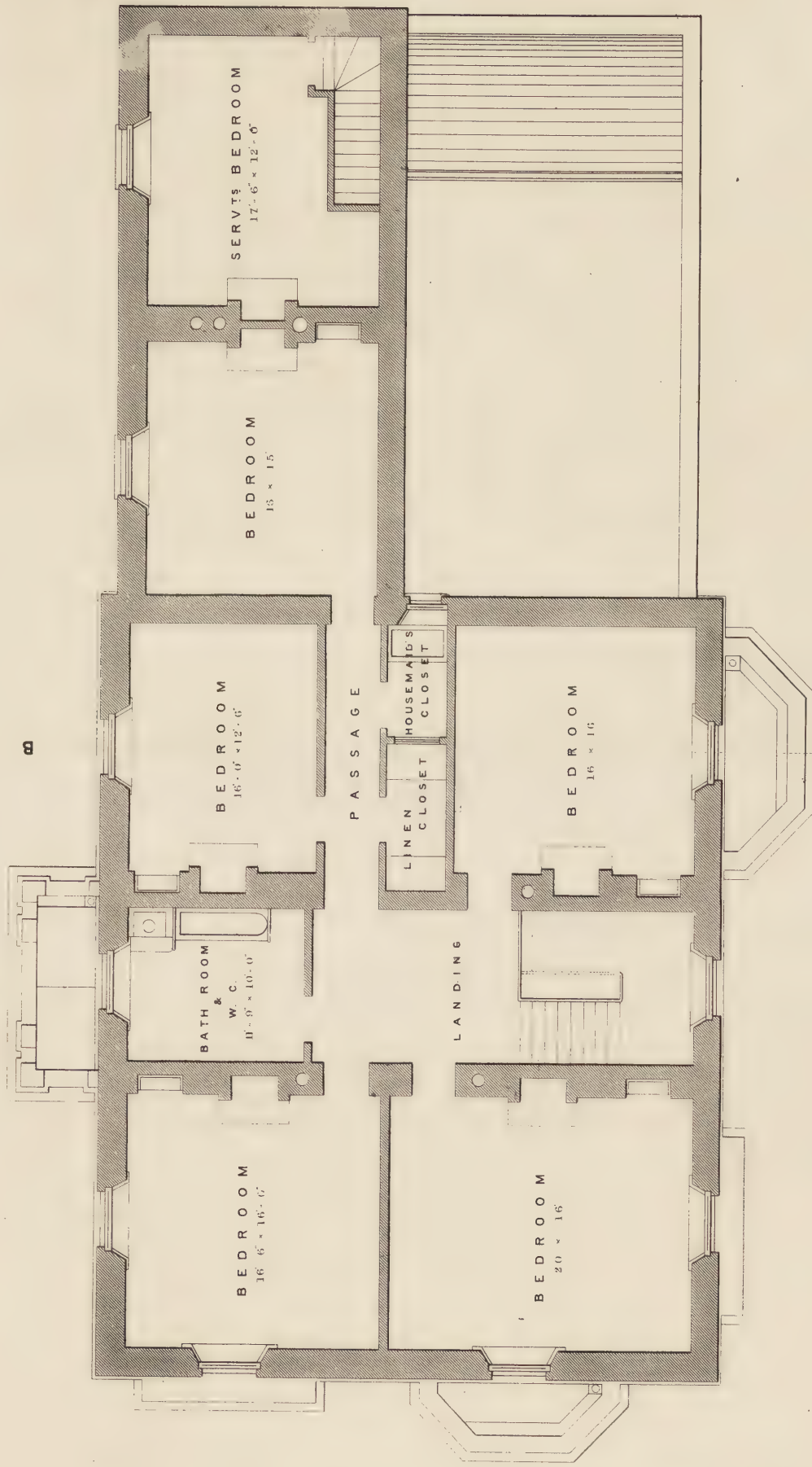
WILLIAM MACKENZIE, GLASGOW, EDINBURGH, LONDON & NEW YORK.
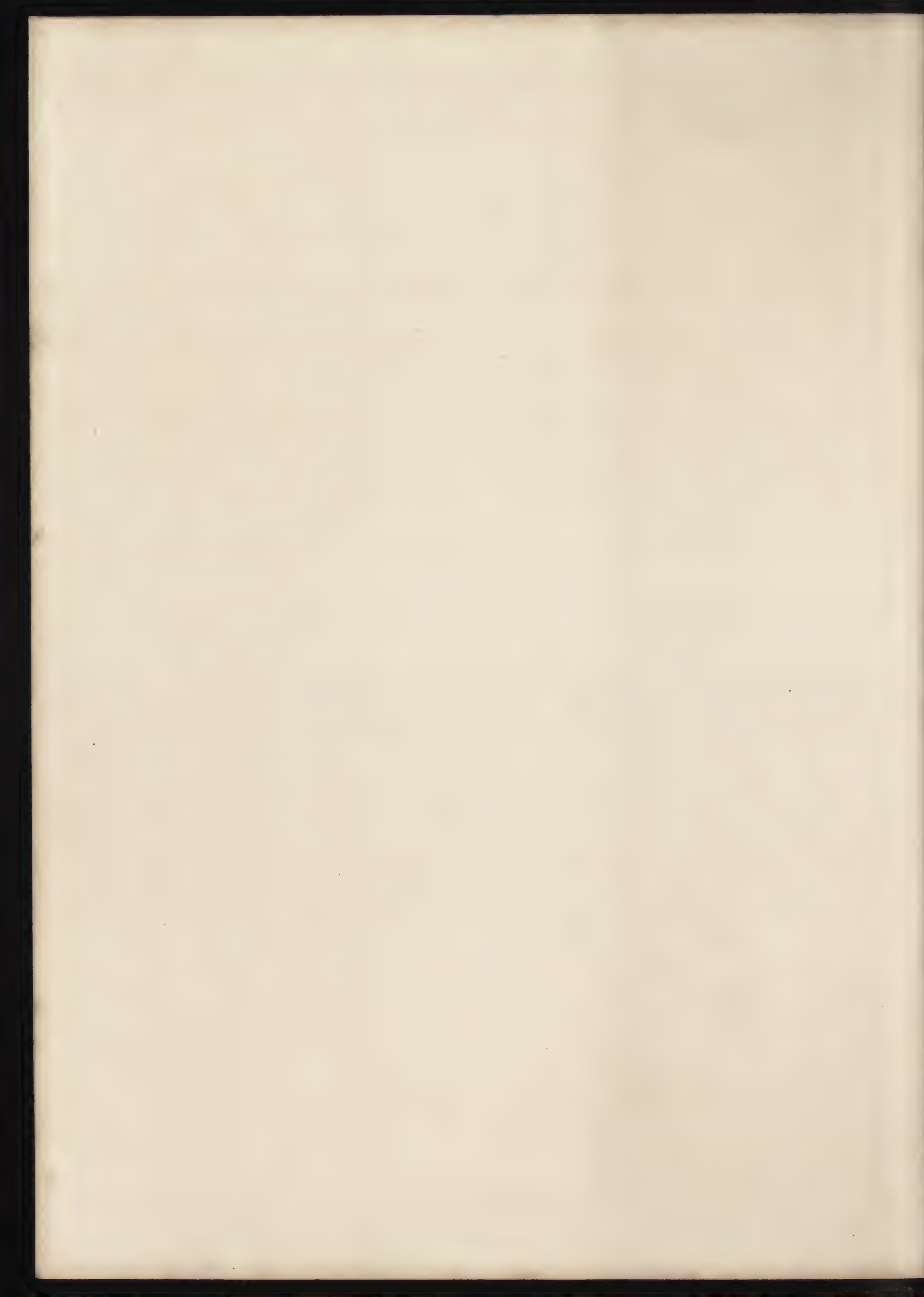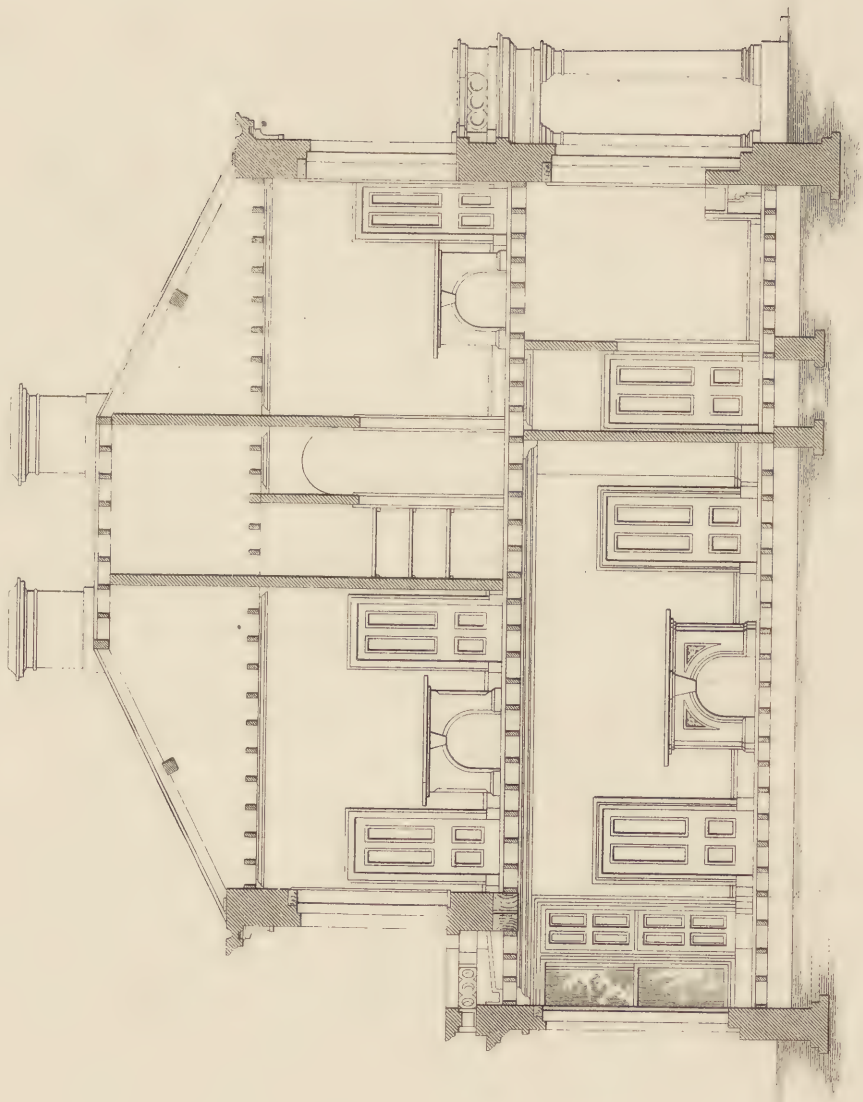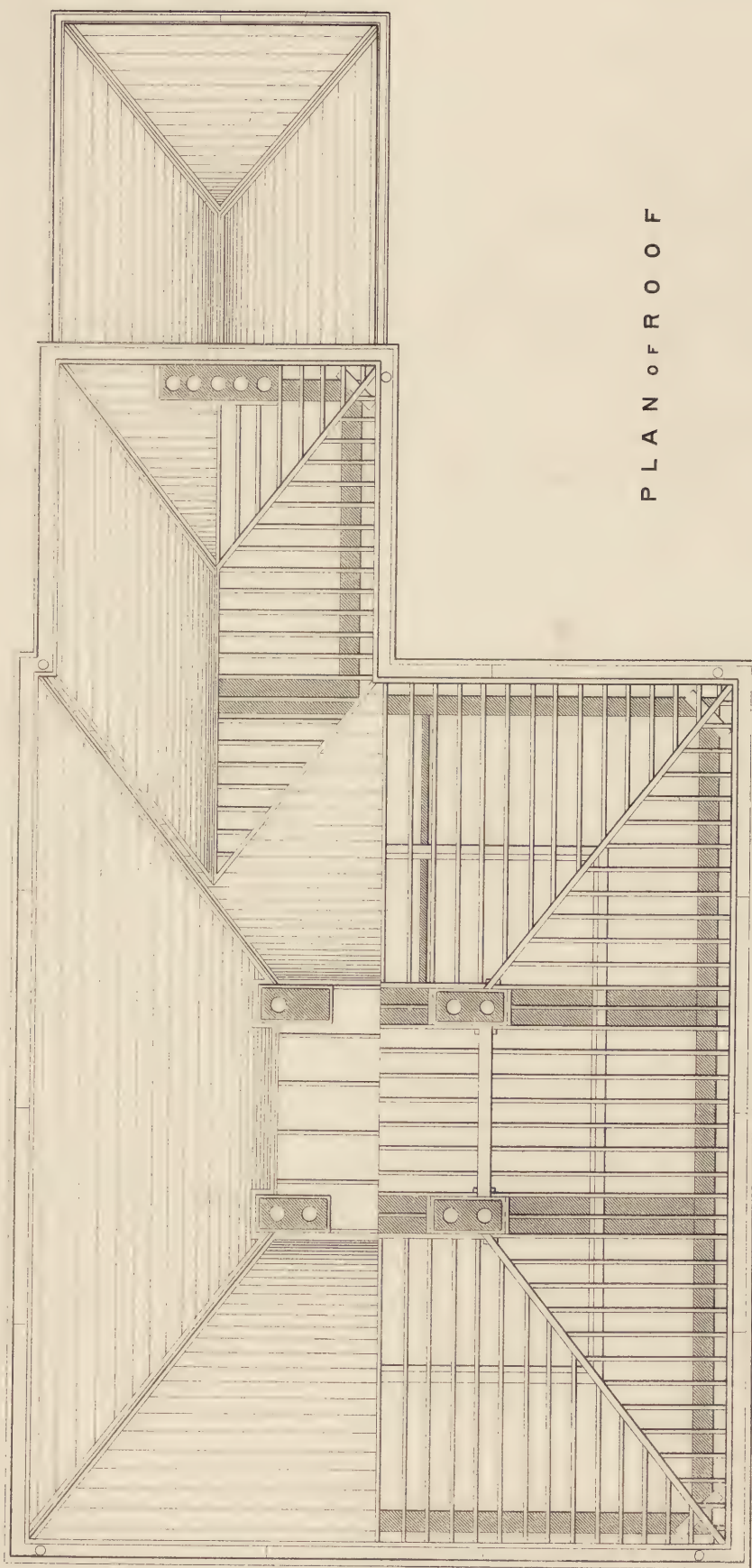
10   5   0   10   20   30   40   50 FEET

GROUND PLAN

PANTRY

SCULLERY
11' 5" × 11' 9"

COALS

PRIVY

ASHES

KITCHEN
16' × 15'

COURT

STORE

BUTLER'S PANTRY
10' 0" × 8' 6"

SINK

PASSAGE

DINING ROOM
22' × 16'

VESTIBULE
10' × 8'

B

HALL
&
STAIRCASE

MORNING ROOM
16' 0" × 14' 3"

DRAWING ROOM
22' 6" × 16' 6"

A

5   0   10   20   30   40   50 FEET

ITALIAN VILLA.

SECTION AT A.B.

10 5 0 10 20 30 40 50 FEET

ITALIAN VILLA.

PLAN of ROOF

10   5   0   10   20   30   40   50 FEET

PLATE 7

DETAIL OF CHIMNEYS

CORNICE OF SCULLERY WING

DETAILS ½ INCH TO THE FOOT

A

B
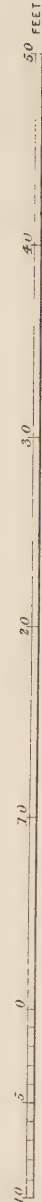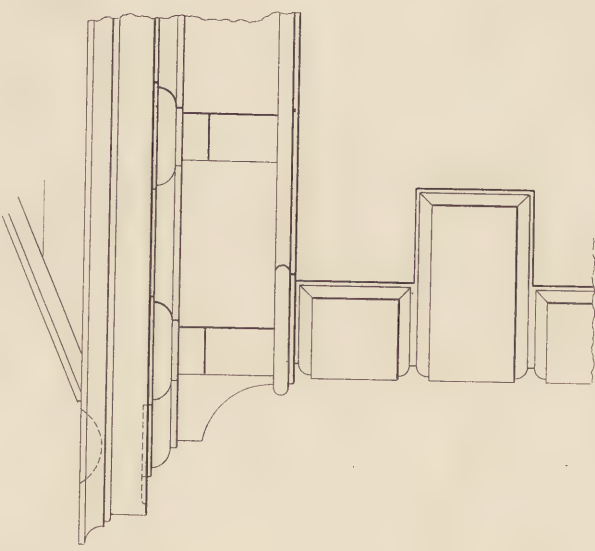
BEDROOM WINDOWS

DETAIL OF MAIN CORNICE

JAMB AT A-B.
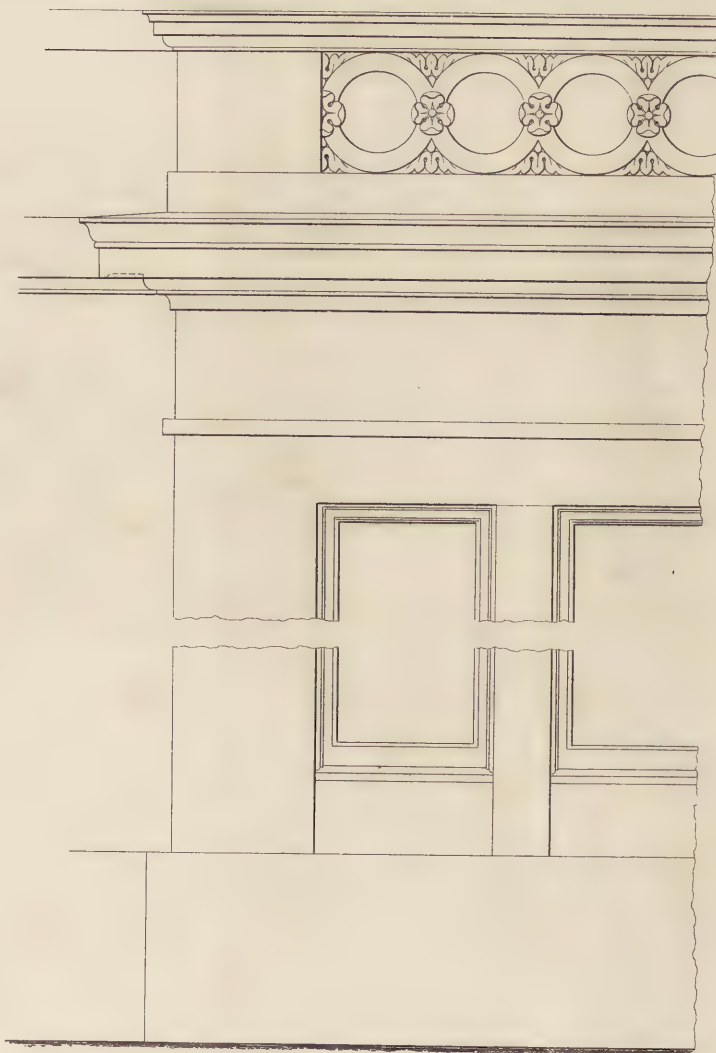
DETAILS OF PORCH

DETAILS OF PROJECTING WINDOW
IN DRAWING ROOM

ARCHITRAVE OF LOWER
WINDOWS
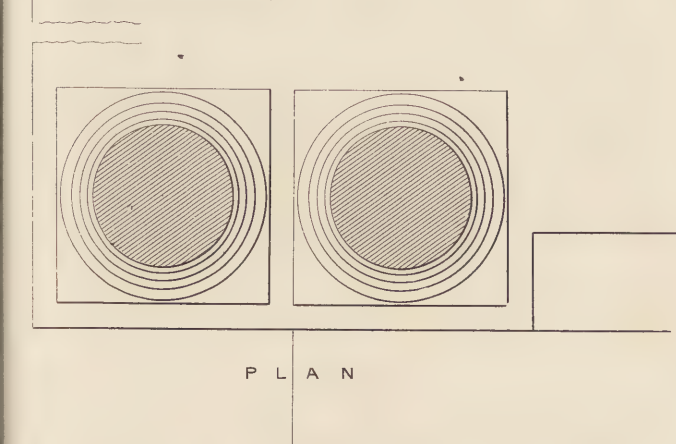
PLAN
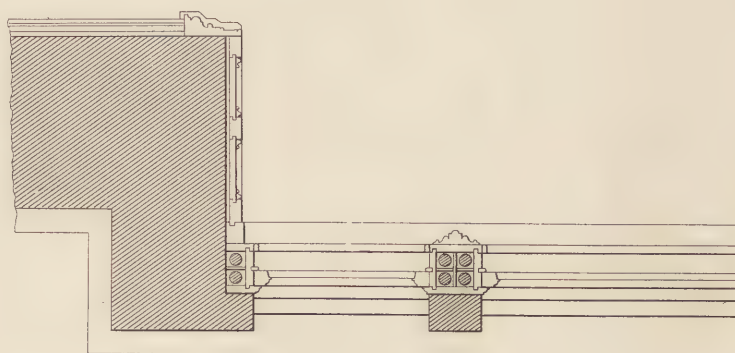
PLAN

PLATES $\frac{C}{1}$ — $\frac{C}{8}$.

DESIGN FOR A VILLA IN THE ITALIAN STYLE.

PLATES $\frac{C}{1}$ — $\frac{C}{8}$ contain Ground Plan, Bedroom Plan, South Elevation, North Elevation, Section, Roof Plan, and Details of a Villa designed in the Italian style.

The Design is of a simple and substantial character, no useless ornament being introduced in any portion of the exterior. The interior is arranged so as to be thoroughly convenient throughout.

The Villa is shewn to be built of stone, but a pleasing and warm effect would be secured by building the general walls of pressed red brick, and executing the finishings in a light-coloured stone.

The windows of the main portion of the house should be filled in with plate glass in two or four panes. The windows of the kitchen wing should be filled with sheet glass.

PLATES $\frac{C}{3}$ — $\frac{C}{4}$.—GROUND PLAN.—The arrangement of the Ground Floor is very simple, and the position of its various apartments renders it perfectly convenient.

The entrance door, protected by a large projecting portico, opens into a vestibule which is divided from the central hall by an ornamental partition having swinging doors filled with enriched glass.

The vestibule measures 10 feet by 8 feet, exclusive of the large recess in the side wall. The hall and staircase are 10 feet wide throughout. The stair has treads 4 feet by 10 inches.

The dining room opens direct from the hall and measures 22 feet by 16 feet, exclusive of bay window and sideboard recess. The former is 12 feet by 6 feet: the latter is 7 feet 6 inches by 1 foot 10 inches.

A communication between the dining room and the kitchen, butler's pantry, &c., is provided in the back wall of the small recess on the right of the sideboard. This arrangement allows the dishes, &c., to be conveyed to and from the dining room without

having to be carried through the hall; and prevents all necessity for the servant in waiting to leave the room during dinner.

The recess and also the cupboard on the opposite side of the sideboard are to have doors to match the one from the hall.

The drawing room, situated towards the south-west, opens also direct from the hall, its door being opposite that of the dining room. It measures 22 feet 3 inches by 16 feet, exclusive of the two projecting windows, which measure respectively 10 feet 3 inches by 5 feet, and 8 feet 4 inches by 2 feet.

The morning room or breakfast parlor opens from the hall on the same side as the drawing room. It measures 16 feet by 14 feet 3 inches, exclusive of the window projecting towards the west, which is 8 feet 6 inches by 2 feet.

The kitchen, situated in the north-east wing, measures 16 feet by 15 feet. It is approached from the hall by a passage, off which are conveniently placed the butler's pantry and store room. The wicket from the dining room opens on to this passage close to the kitchen and butler's pantry doors. The wicket should be about 2 feet 6 inches square, and situated about 2 feet 6 inches from the floor.

The store room is fitted up with shelves and presses. The pantry has shelves, lock-up presses, sink, drainer, &c., complete.

To the east of the kitchen are placed a scullery, measuring 11 feet 9 inches square, and a convenient cook's pantry.

The stairs to the servants' bedroom start from the kitchen lobby.

A large court-yard, with the necessary outbuildings, is provided, as shewn.

Cellars may be excavated underneath any portion of the house as required: the stairs to which will be under the first flight of the principal stairs.

The height of the Ground Floor is 12 feet 4 inches.

BEDROOM PLAN.—On the First Floor there are five large bedrooms and a servants' bedroom over the scullery and cook's pantry. The room over the drawing room, which is furnished with two windows looking south and west, measures 20 feet by 16 feet. The one over the morning room, also furnished with two windows, measures 16 feet 6 inches by 16 feet. The bedroom over the dining room measures 16 feet by 16 feet. That over the store and butler's pantry is 16 feet by 12 feet 6 inches. That over the kitchen is 16 feet by 15 feet. The servants' bedroom measures 17 feet 6 inches by 12 feet.

A large and completely fitted bath-room is provided over the vestibule.

A linen closet fitted up with shelves, and a housemaid's closet with water supply and large sink, open from the passage leading to the bedroom over the kitchen.

All the bedrooms are provided with fire-places and wall presses.

The height of the Bedroom Floor is 13 feet.

DESIGN FOR A VILLA IN THE ITALIAN STYLE.

PLATES $\frac{c}{1}$ — $\frac{c}{2}$ contain North and South Elevations. The South Elevation or garden front shews the square projecting window of the drawing-room and the bay window of dining room. The side of the bay of drawing room is shewn on the left of the elevation. The two centre windows light the hall, staircase, and landing on the bedroom floor. The court-yard wall and the upper portion of kitchen wing are drawn on the right.

In the centre of the North Elevation is the entrance door and portico. On the left hand is the kitchen wing; on the right is shewn the side of the projecting window of morning room.

PLATES $\frac{c}{5}$ — $\frac{c}{6}$ contain the Section and Roof Plan. The Section is cut on the line A—B. It shews the dining room, passage to kitchen, and butler's pantry, on the ground floor: the bedroom over dining room, linen closet, passage, and bedroom over pantry and store, on the upper floor. The side of the portico is drawn on the right of the Section.

The Roof Plan is drawn showing one half slated and the other in the naked timbers. In the centre of the main roof is a lead platform 14 feet by 12 feet.

PLATES $\frac{c}{7}$ — $\frac{c}{8}$ contain detail drawings of the portico, projecting windows, bedroom windows, main cornice, cornice of the low portion of kitchen wing, and the chimneys. The bay windows have their details precisely similar to those of the square projecting windows. A section of the architraves round the other windows of the ground floor is given in the centre of the Plate $\frac{c}{8}$.

The details are all drawn to the scale of one half inch to the foot.

FRONT ELEVATION

COURT

ASHES

PRIVY

PASSAGE

SCULLERY
9'·6" × 6'·0"

STAIR

PANTRY
9'·6" × 5'·6"

ROOM
14' × 11'

LIVING ROOM
15' × 14'

LOBBY
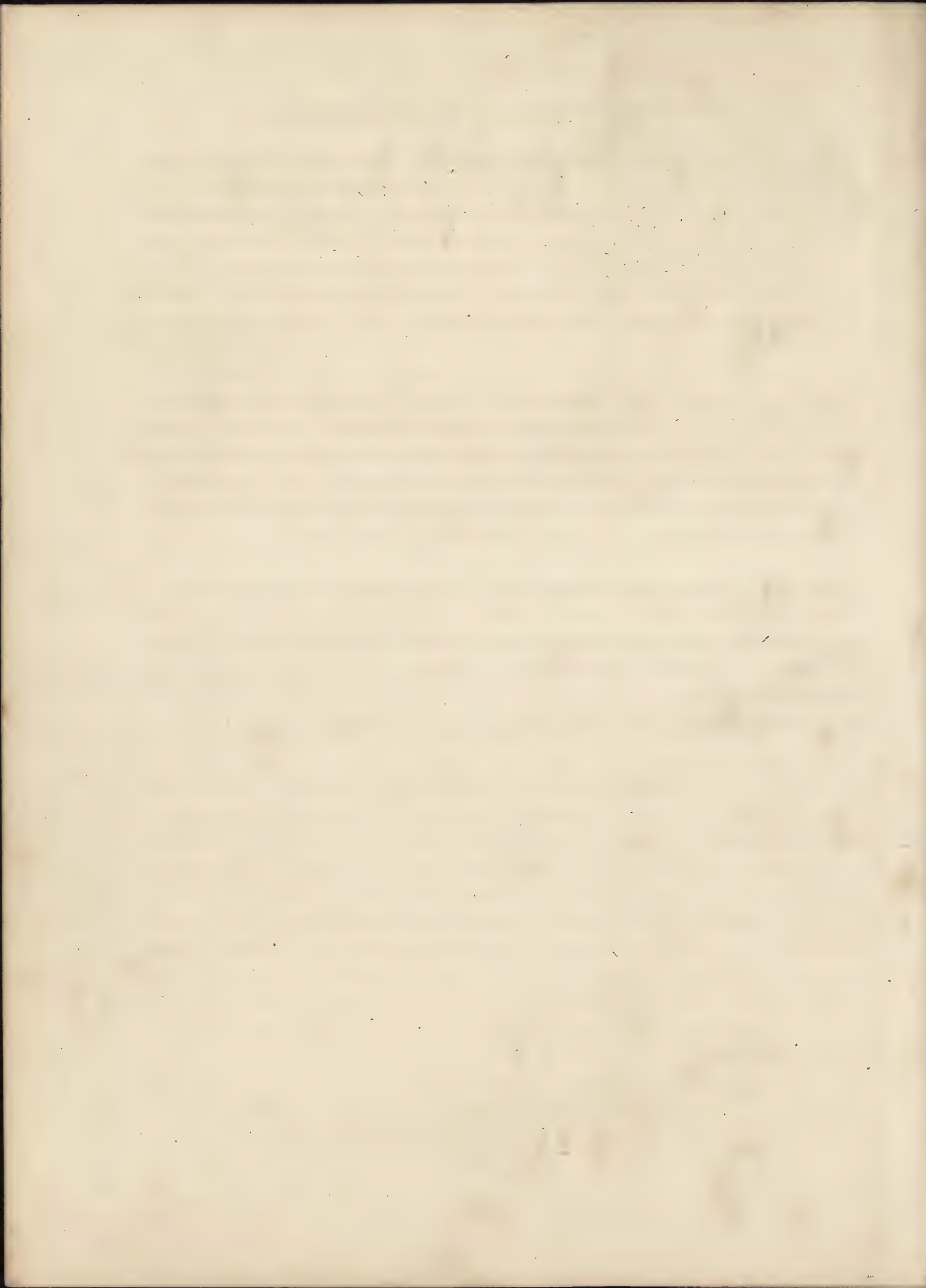
GROUND PLAN

SECTION AT A.B.

CLOSET
14' · 6'

CLOSET

LANDING
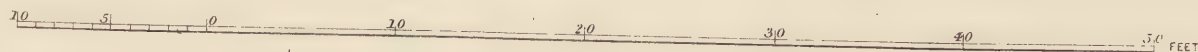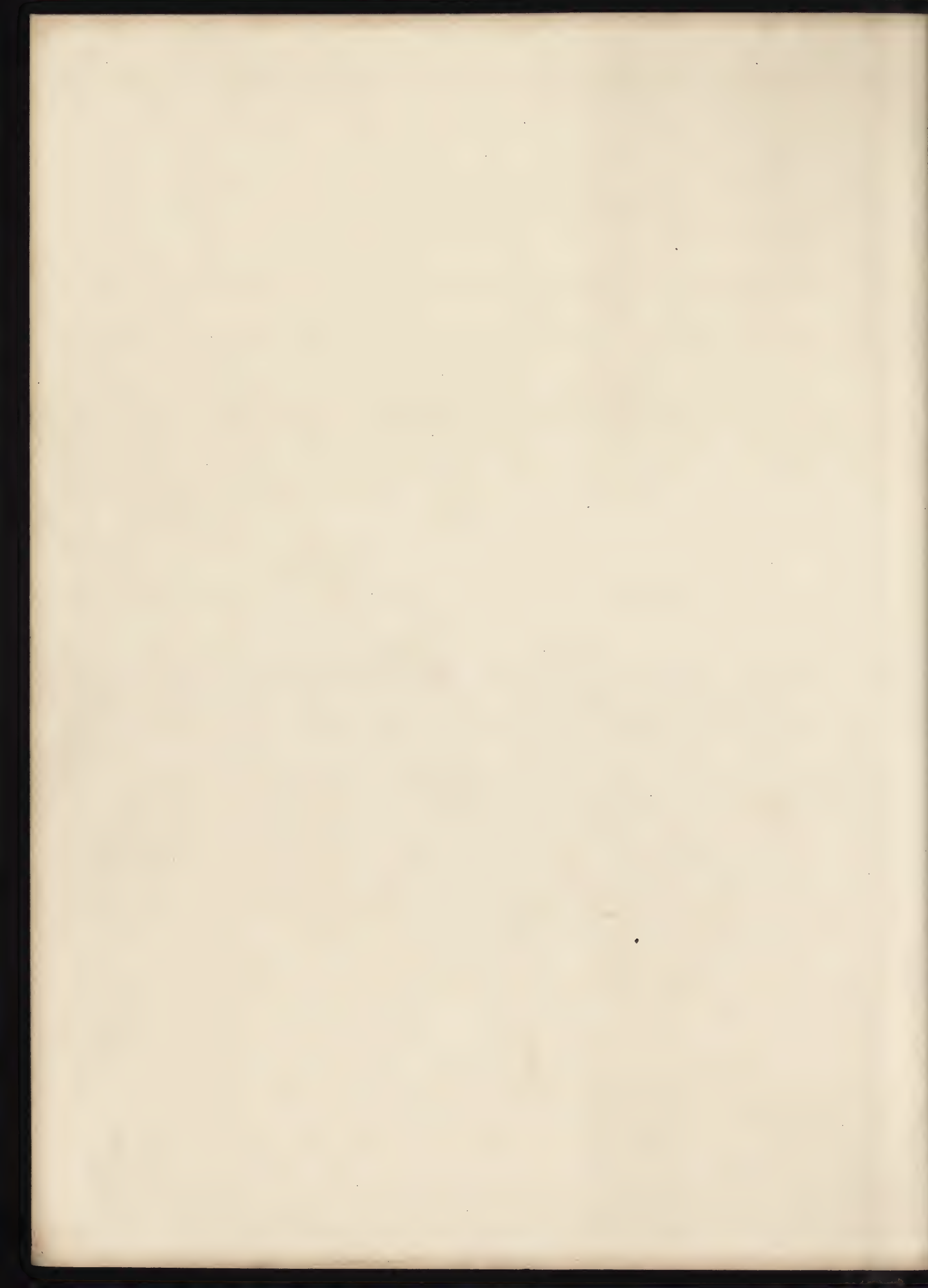
BEDROOM
17 · 14

BEDROOM
14' 6" · 11' 9"

BEDROOM PLAN
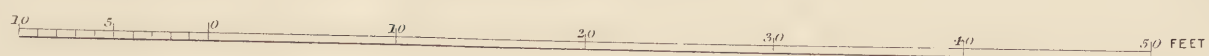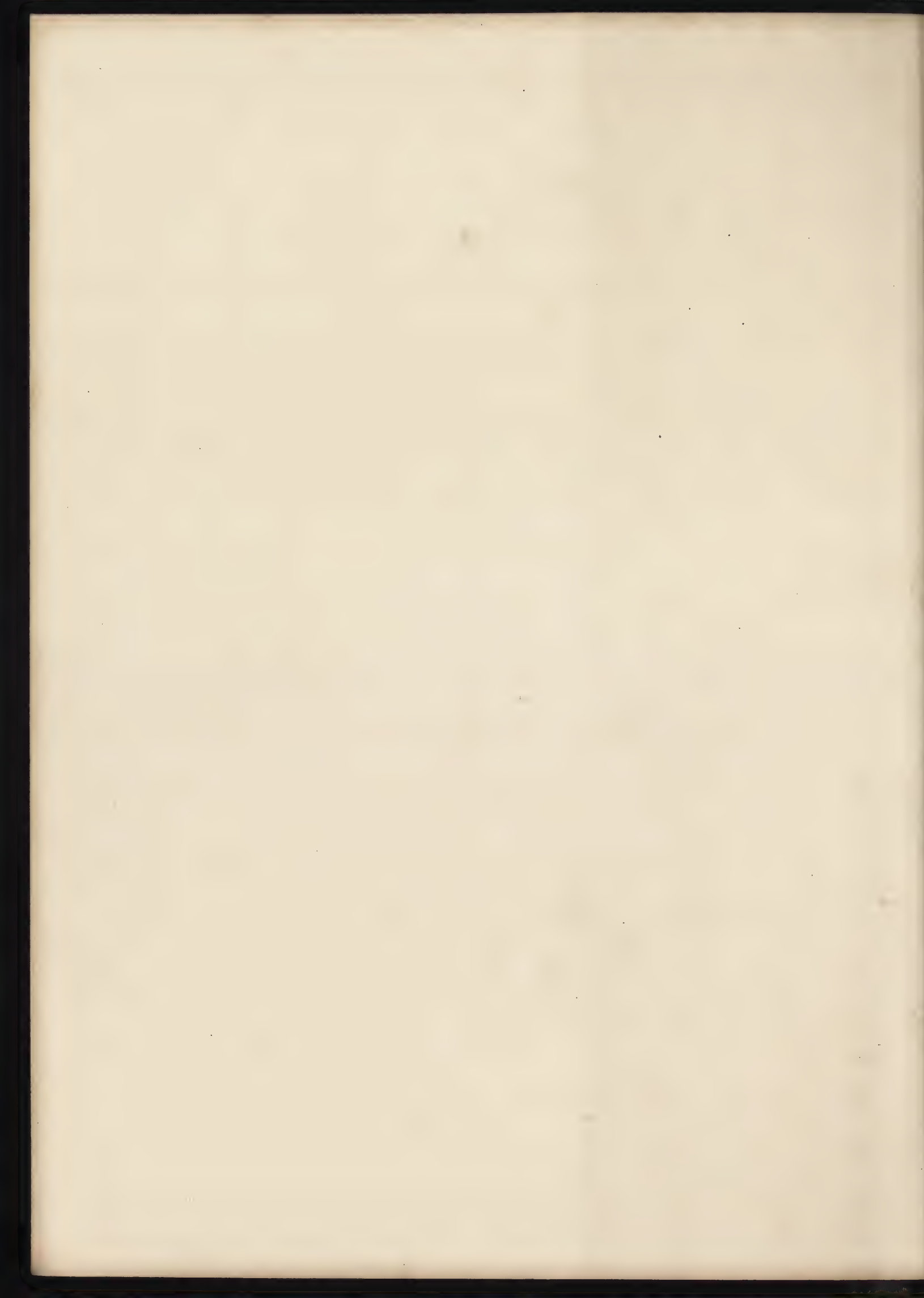
ROOM WINDOW

LIVING ROOM WINDOW
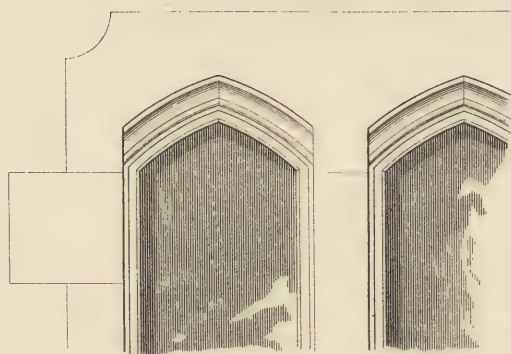
CHIMNEY
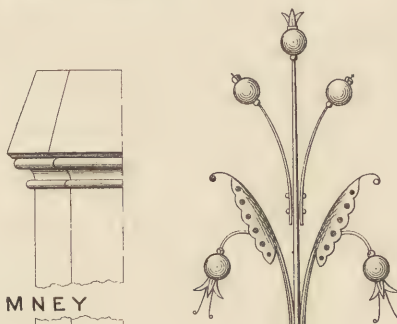
APEX OF
FRONT GABLE
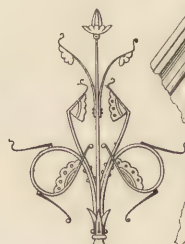
SIDE OF BRACKET &c.
OVER DOORWAY
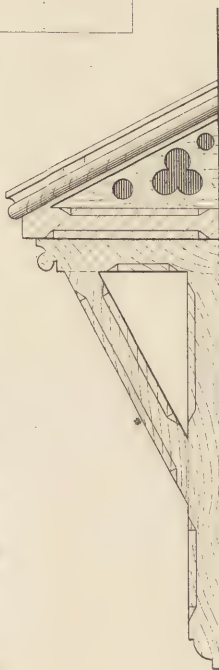
FRONT DOORWAY

DORMER WINDOW
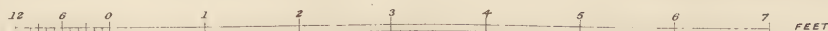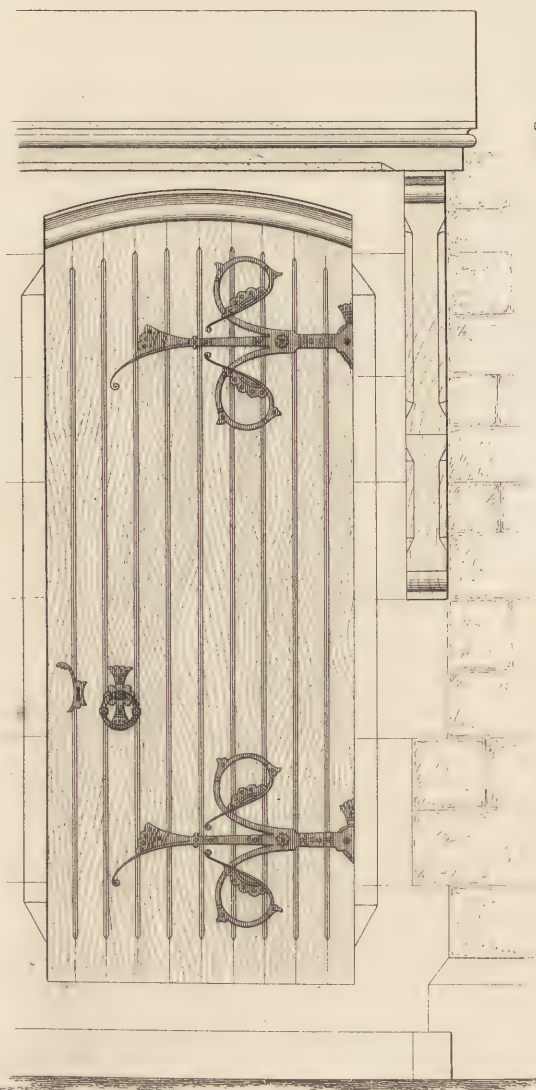
PLATES $\frac{D}{1}$ — $\frac{D}{2}$.

GARDENER'S COTTAGE.

PLATES $\frac{D}{1}$ — $\frac{D}{2}$ contain Ground Plan, Attic Plan, Elevation, and Section of a small and comfortable cottage. It is of a neat and ornamental description. The heads of the windows are shaped and simply moulded, otherwise they are quite plain. The doorway is protected by a wooden canopy, projecting and bracketed from the wall, as shewn in the Section. The barge boards are plain chamfered and pierced at intervals with trefoils, &c. The dormer windows are to be constructed entirely of wood worked and pierced as shewn. The gables and dormer are terminated with rich wrought-iron finials.

GROUND PLAN.—On the Ground Floor there is a parlor opening off the front lobby, measuring 14 feet by 11 feet, also a general living room, measuring 15 feet by 14 feet: to this room is attached a convenient pantry, 9 feet 6 inches by 5 feet 6 inches, fitted with shelves.

A scullery is supplied, opening from the passage between the living room and the back door. It measures 9 feet 6 inches by 6 feet, and is fitted with a sink complete.

A coal-place is situated in the back lobby underneath the stairs.

An ash-pit and privy are provided in outbuildings.

The height of the Ground Floor is 9 feet.

ATTIC PLAN.—On the Attic Floor there are two large bedrooms, measuring respectively 17 feet by 14 feet, and 14 feet by 11 feet 9 inches. There are also a small bed-closet, 14 feet by 6 feet, and a lumber closet. All these open off the landing direct.

The Bedrooms are 8 feet 6 inches high.

SECTION.—The Section drawn on the line A—B cuts the parlor on the Ground Floor and the large bedroom over. It shews the side of the canopy over the entrance door, and the section of the dormer window.
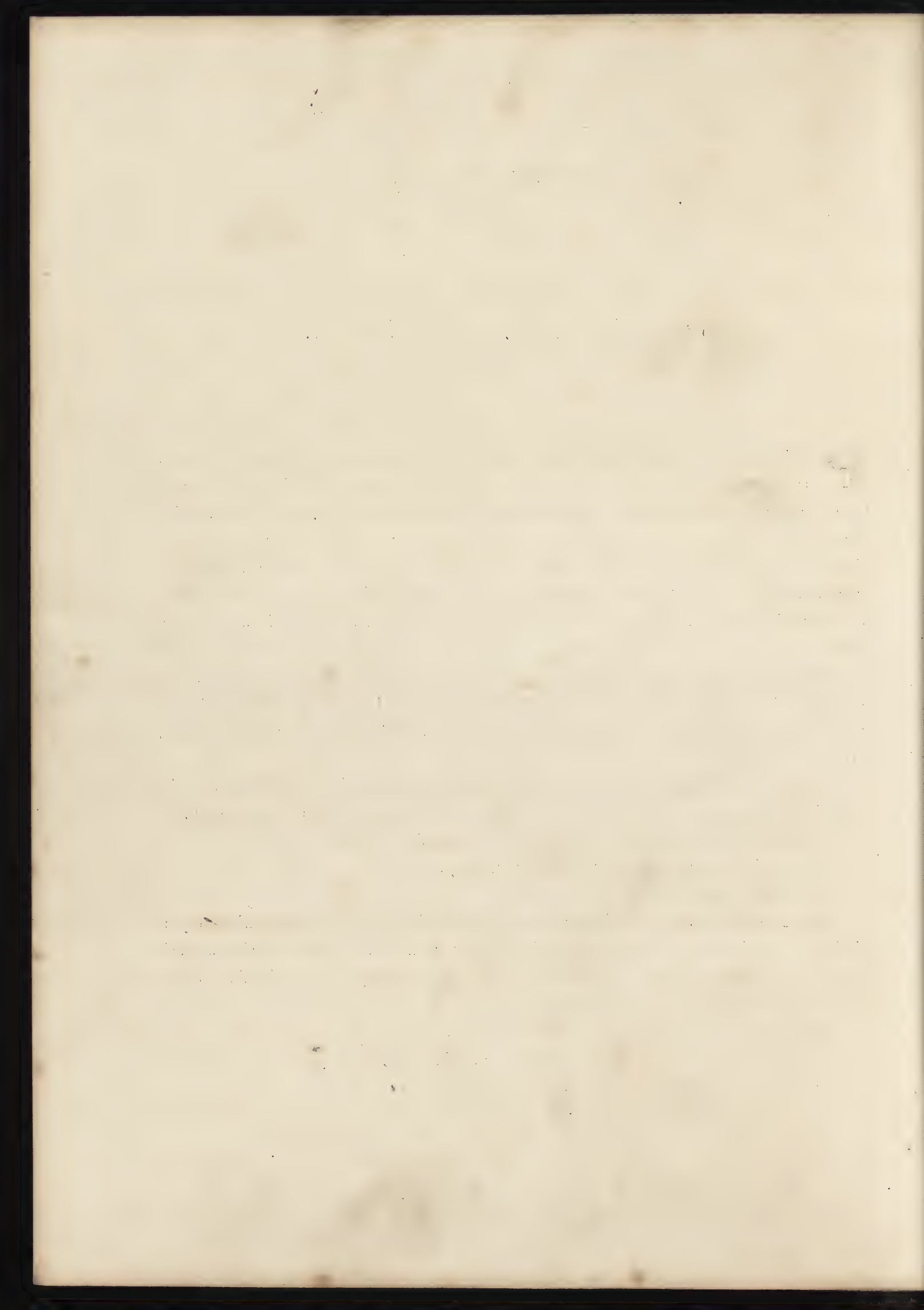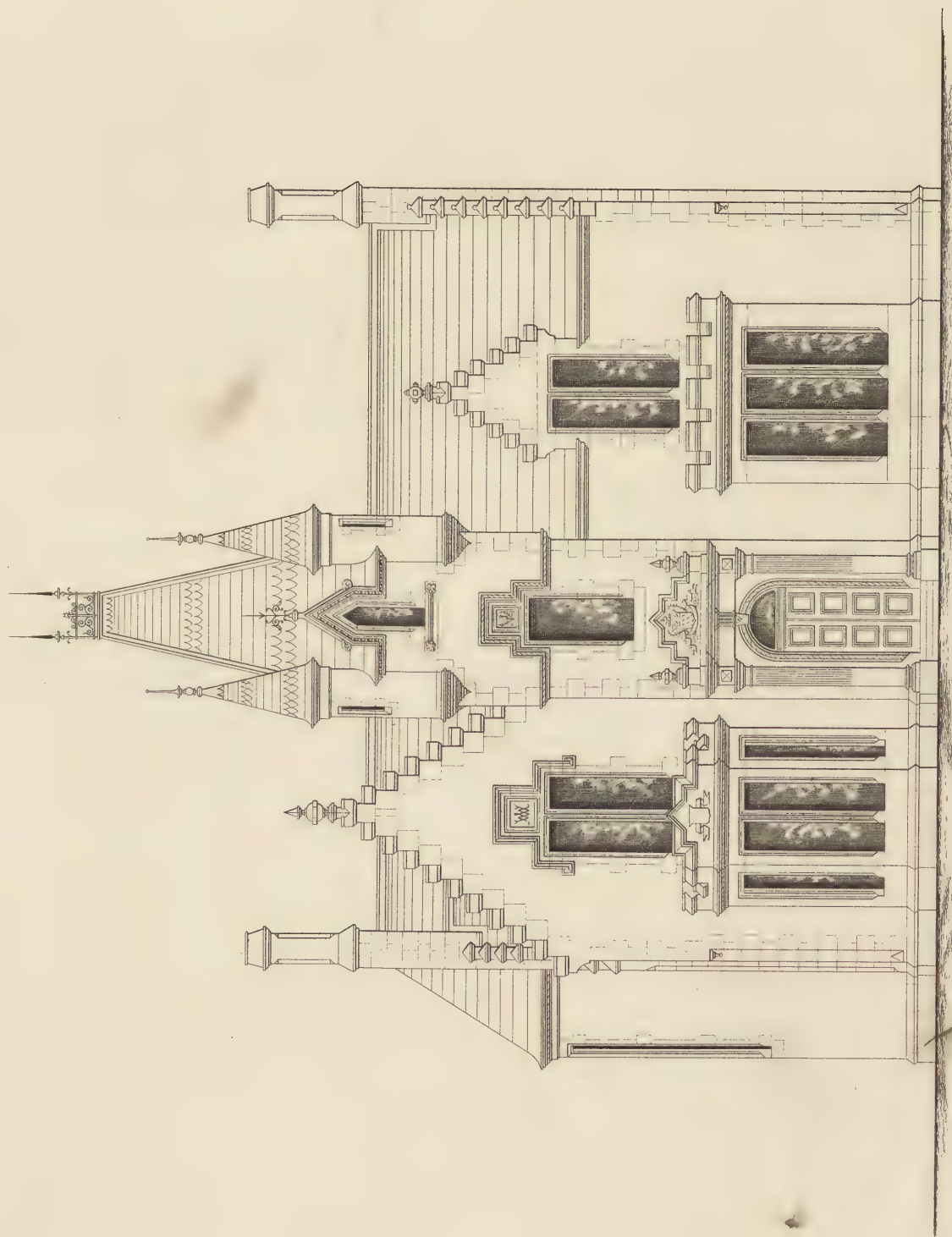
SOUTH ELEVATION
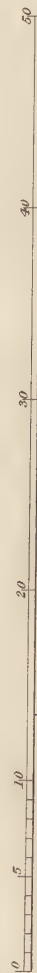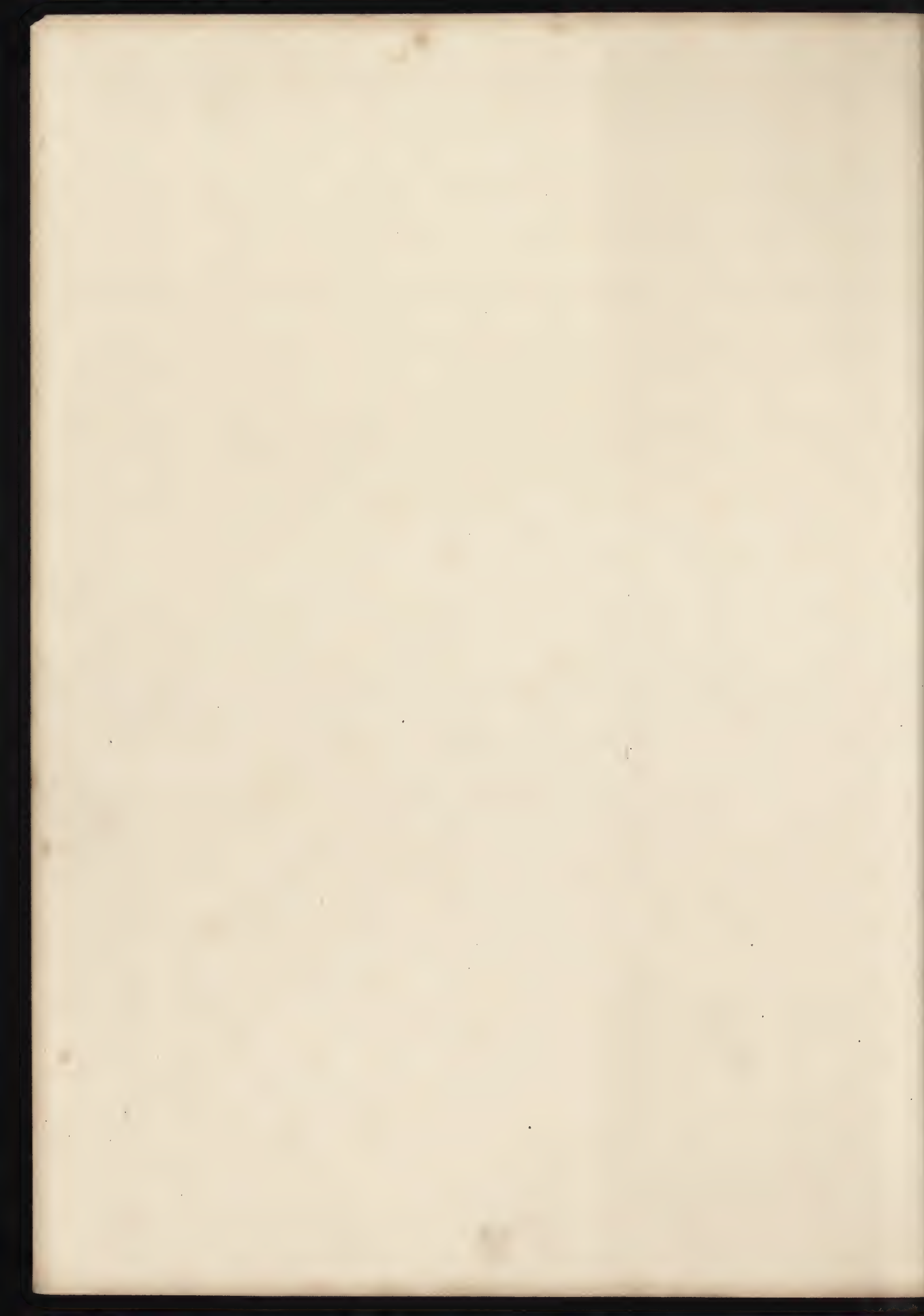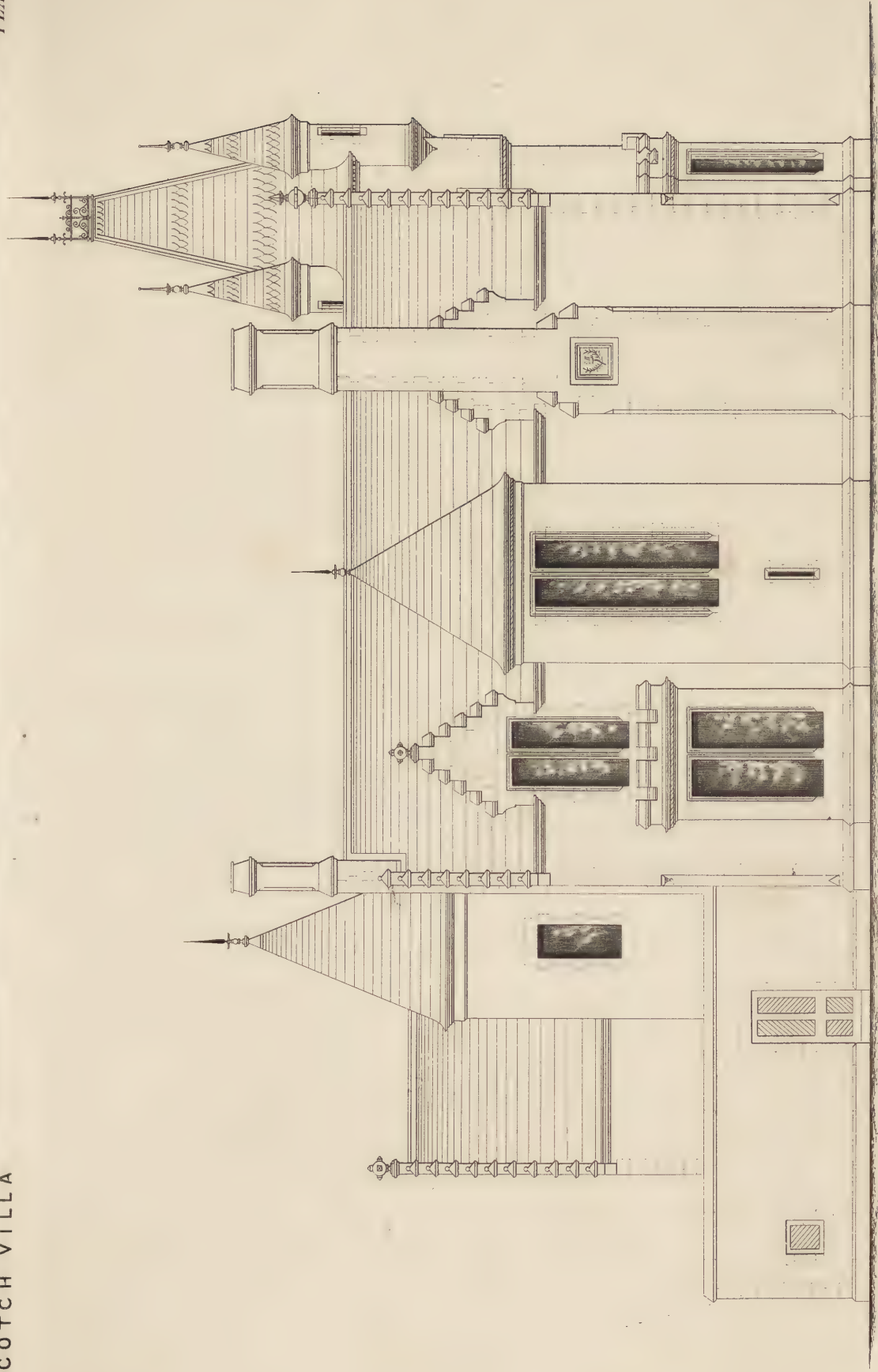
OLD SCOTCH VILLA

WEST ELEVATION

0   5   10   20   30   40   50

ASHES

PRIVY

COALS

PANTRY

LARDER

COURT

B

PORCH

SCULLERY

16' × 10'

Sink

PASSAGE

MORNING ROOM

17' 6" × 14' 0"

KITCHEN

16' × 15'

Cupboards

STAIRCASE

BUTLER'S PANTRY

Sink

DINING ROOM

20' × 16'

DRAWING ROOM

18' 6" × 14' 6"

HALL

PORCH

A

PORCH

GROUND PLAN

FEET

SERVᵗˢ ROOM
16'- 0" × 12'- 6"

W. C.

BATH
ROOM

BEDROOM
15' × 14'

BEDROOM
16' × 16'

LANDING

LINEN CLOSET

BEDROOM
18' 6' × 14' 6

DRESSING
ROOM
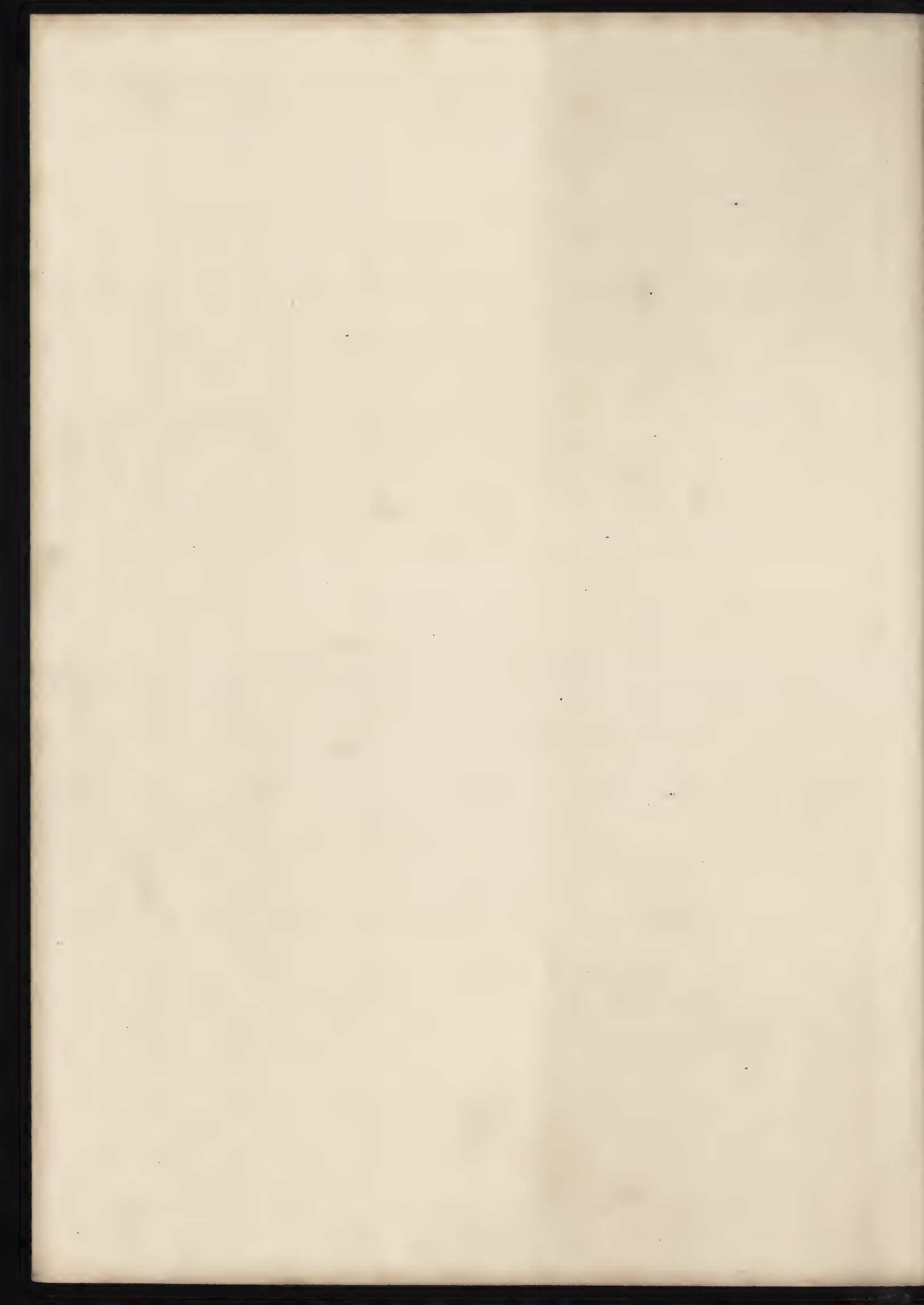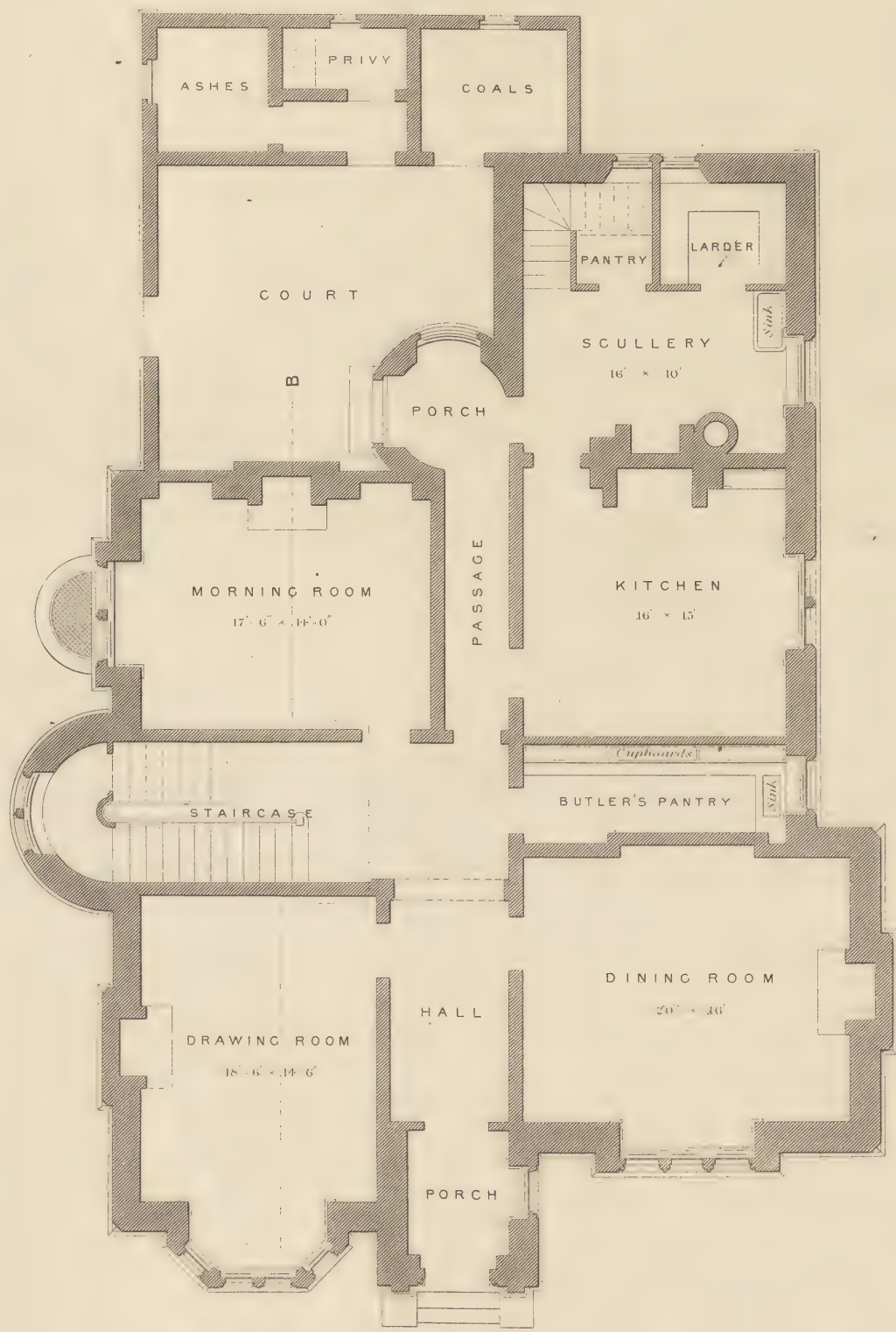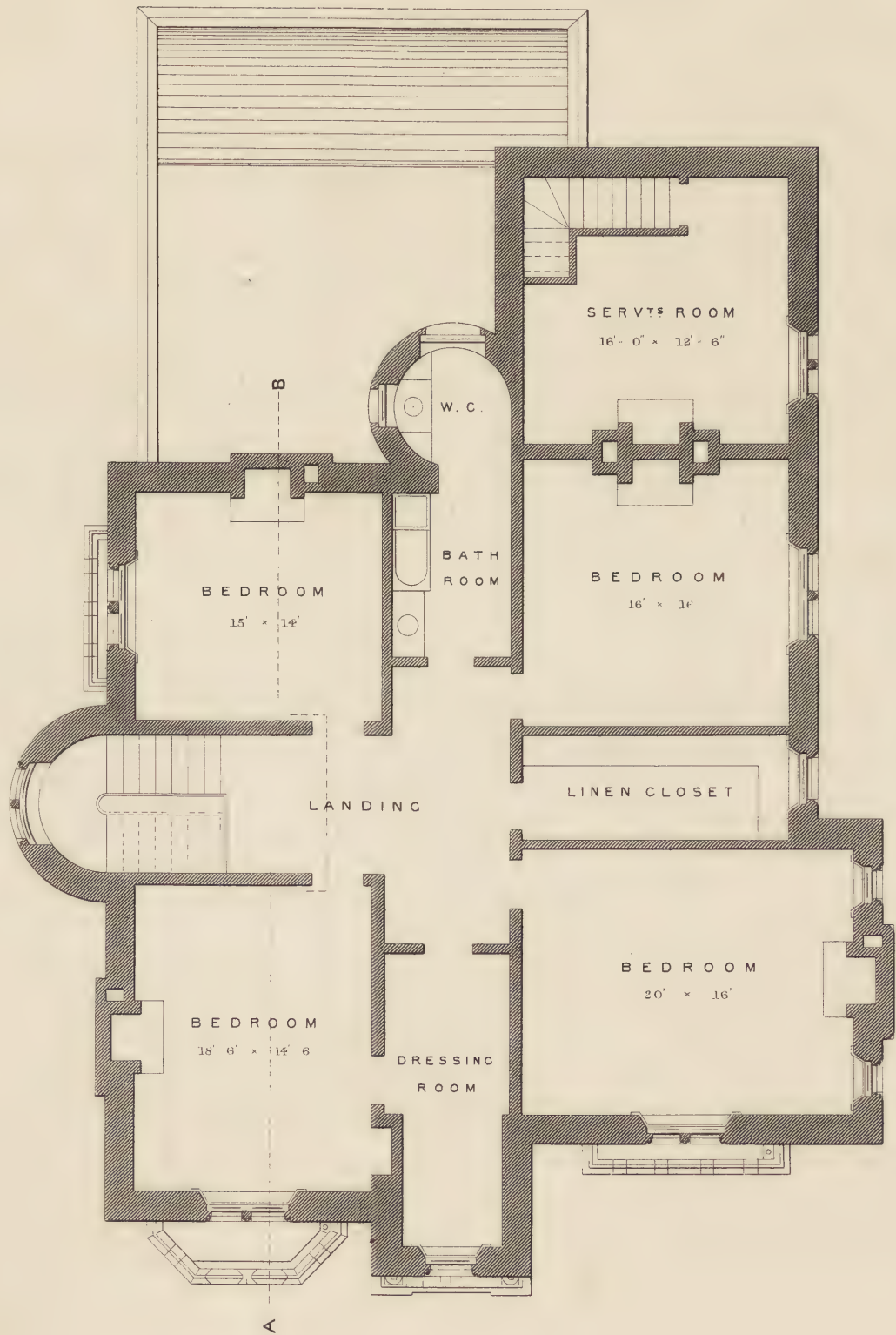
BEDROOM
20' × 16'

BEDROOM PLAN

SECTION AT A.B.

10   5   0   10   20   30   40   50 FEET

CISTERN

PLAN OF ROOF

10   5   0   10   20   30   40   50 FEET
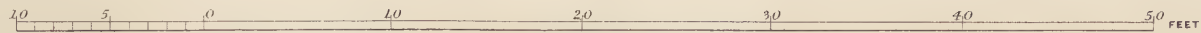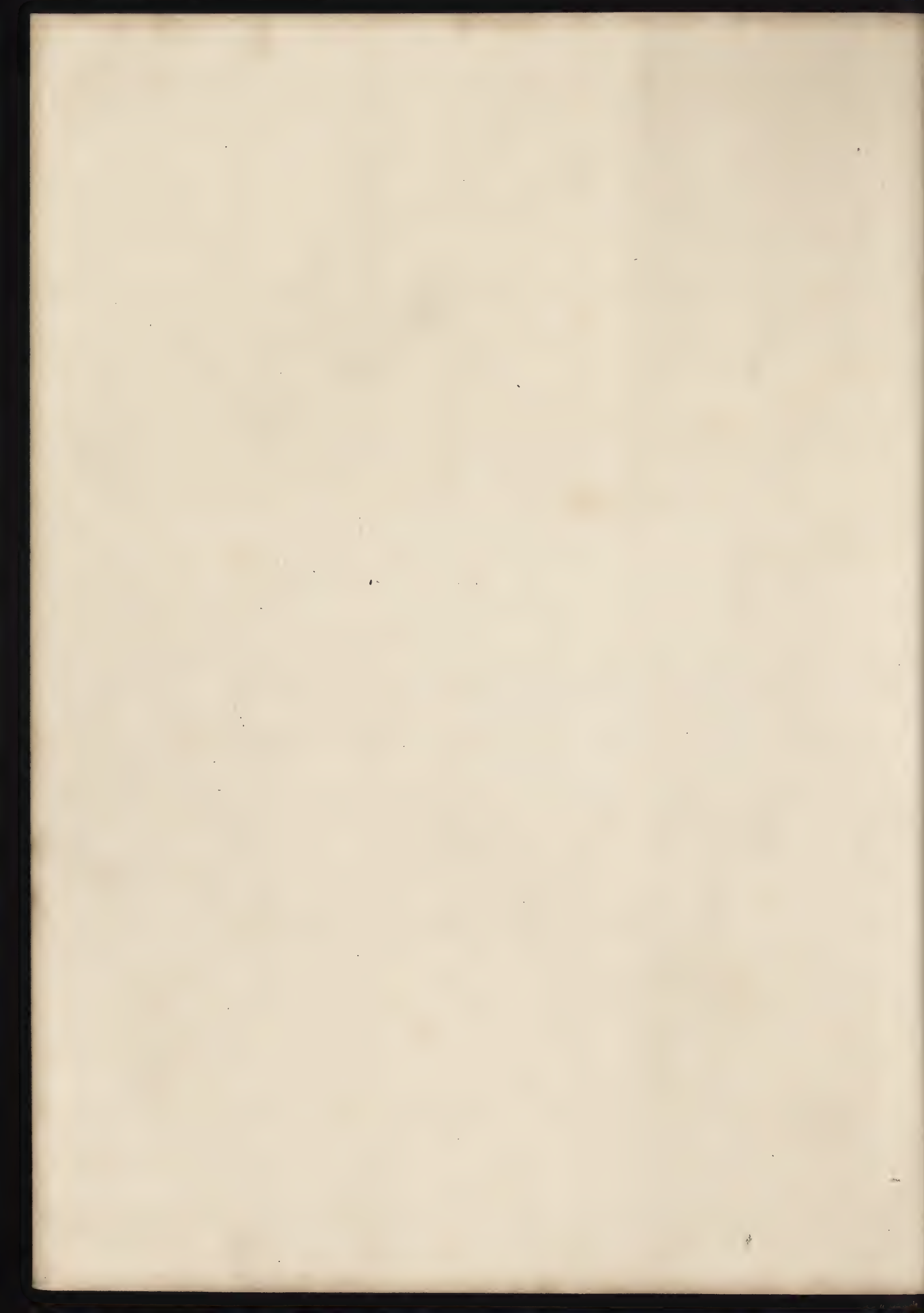
OLD SCOTCH VILLA
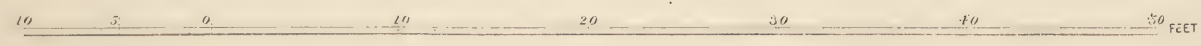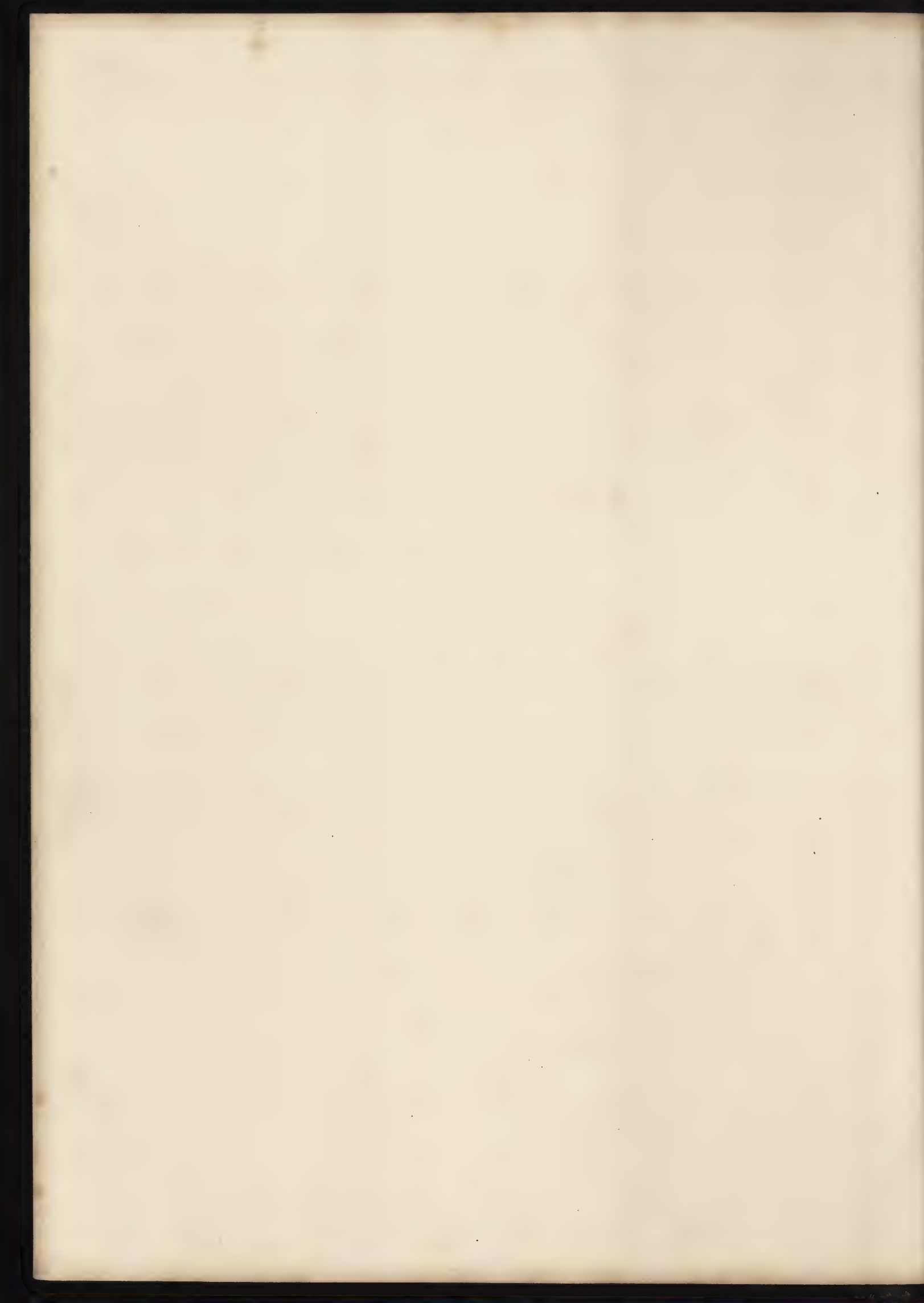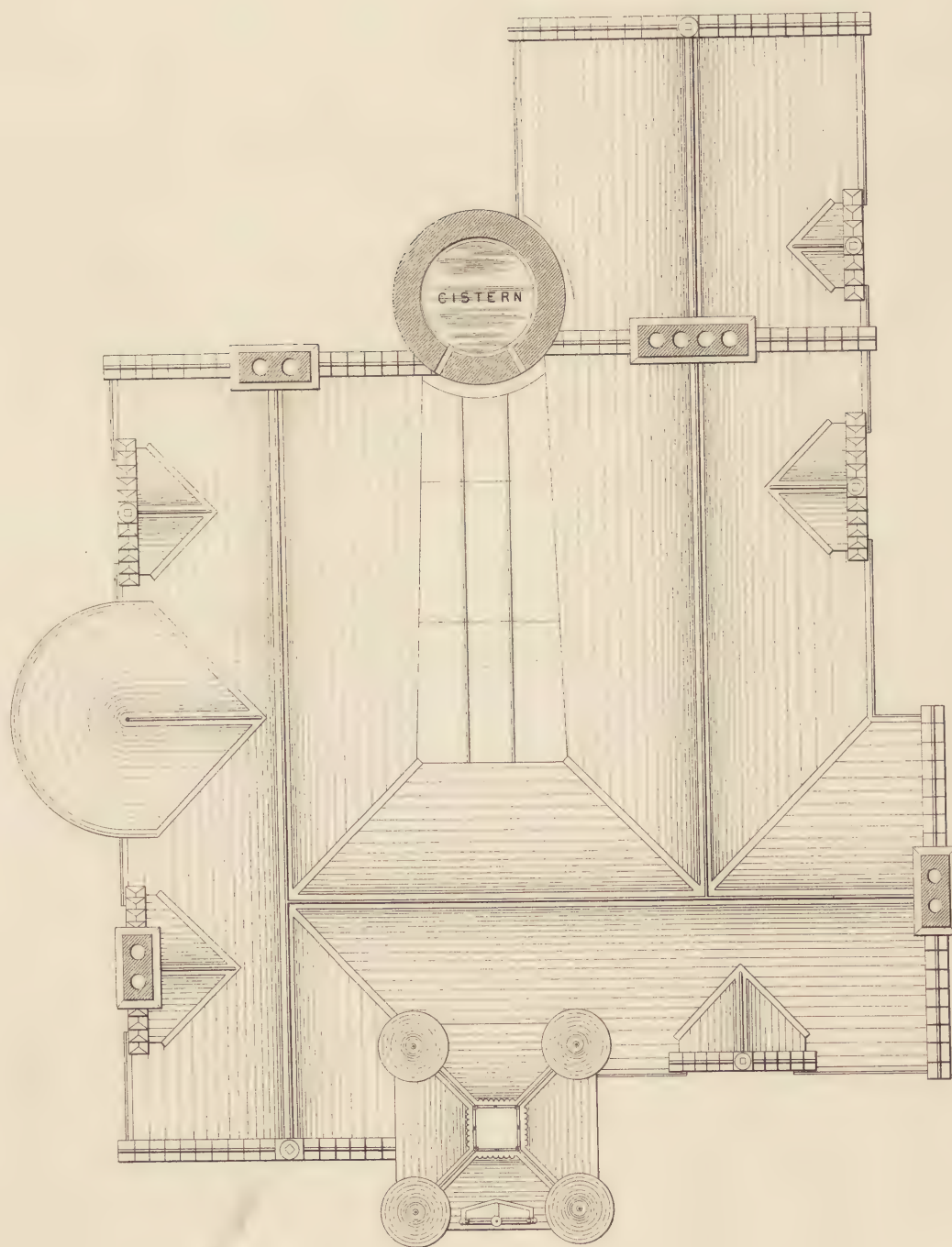
— DETAILS SCALE 3/4 THS INCH TO 1 FOOT —
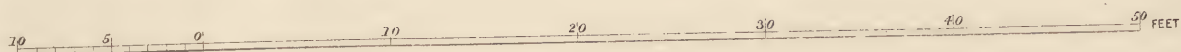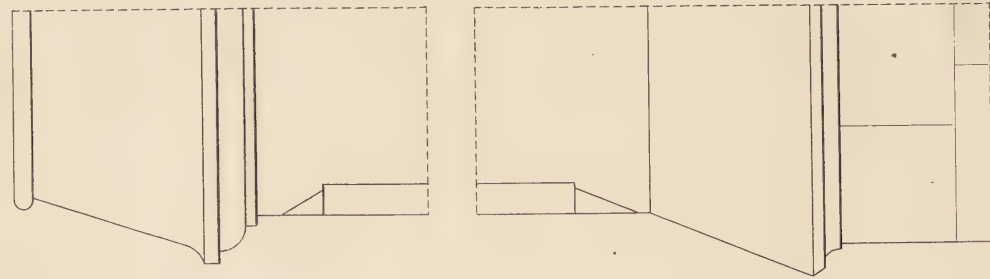
— ENTRANCE DOORWAY —
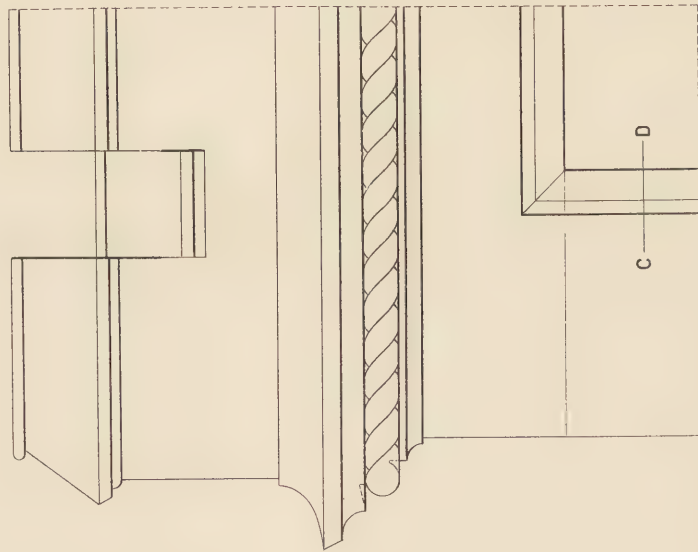
— MOULDING AT C. D. —

— PROJECTING WINDOWS —

— MOULDING AT A. B —

— CHIMNEY HEADS —

A

B

C

D

—DETAILS SCALE 3/4THS INCH TO I FOOT—

—CORNICE OF TOWER—

—CORNICE OF SIDE WALLS—

—CORNICE—

—ROPE—

—CORBEL—

—ROPE—

—STRING ON TOWER—

—ANGLE TURRETS OF TOWER—

—DETAILS OF MAIN GABLES—

—HOOD MOULD &c OF WINDOW OVER BAY—

E ———————— F

—MOULDING AT E F.—
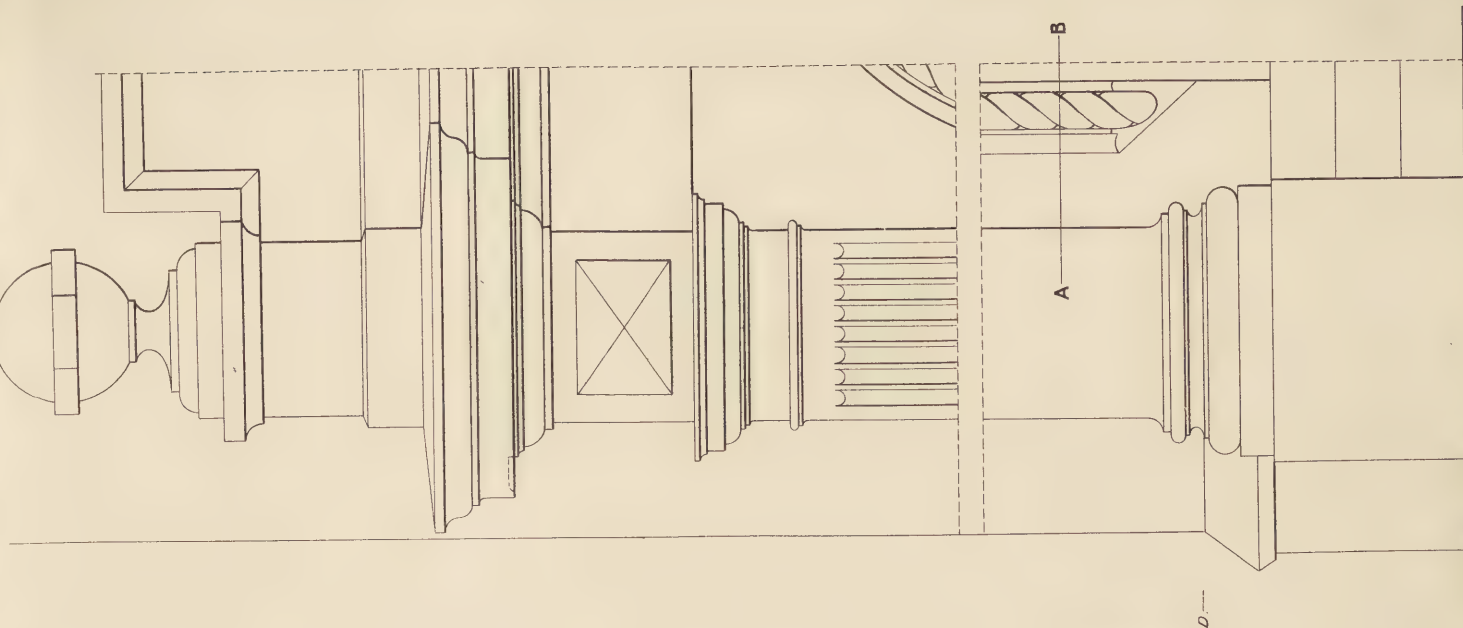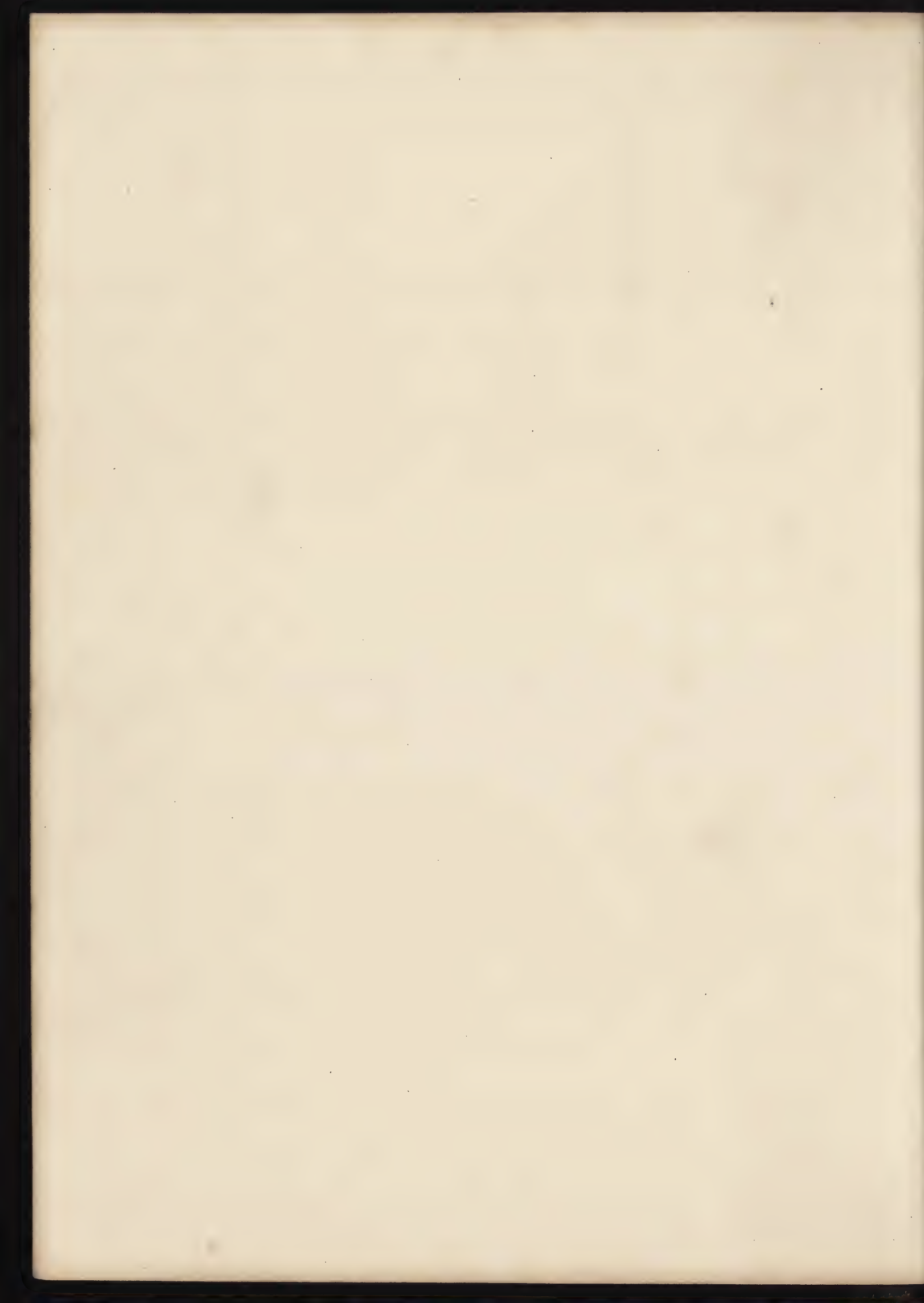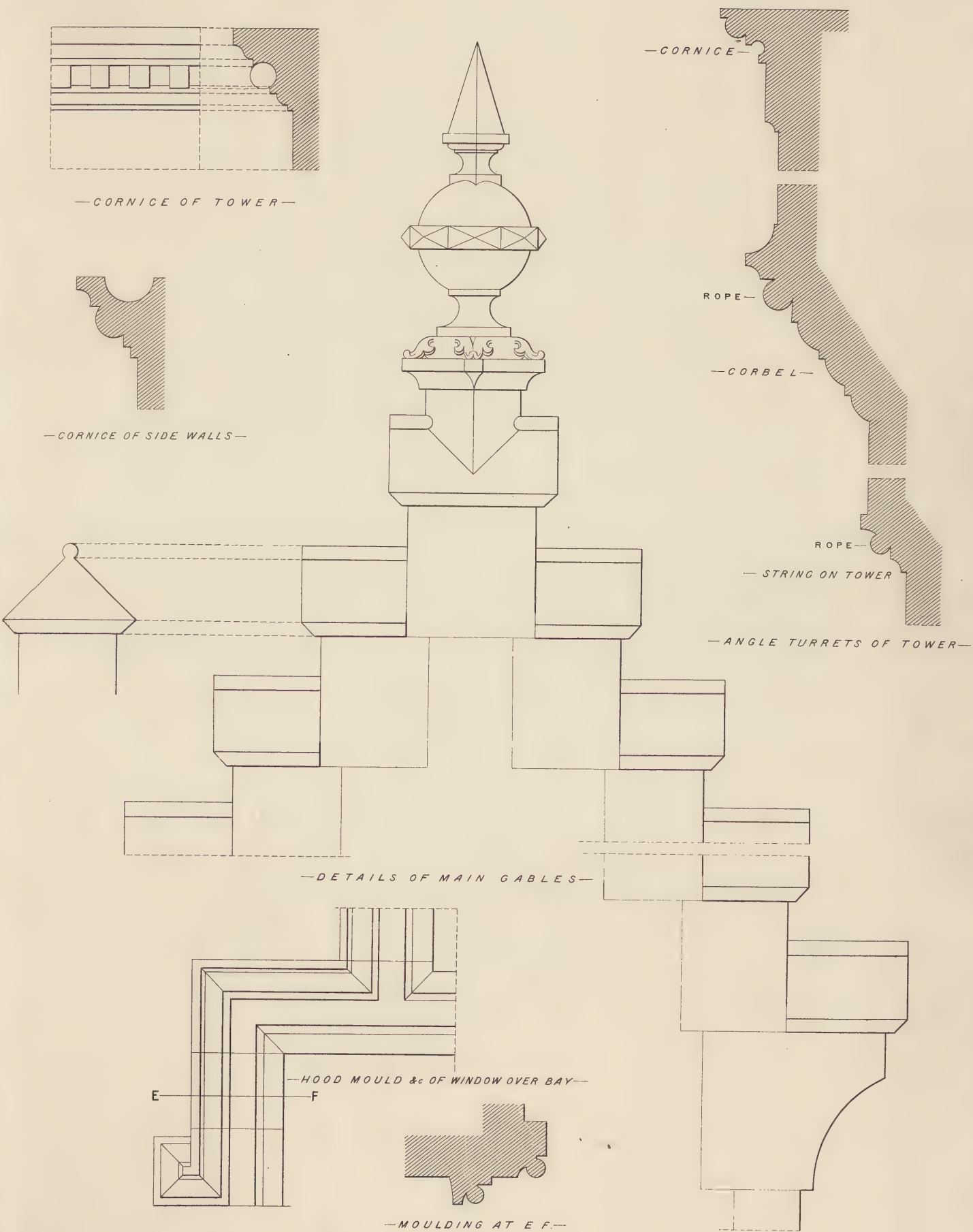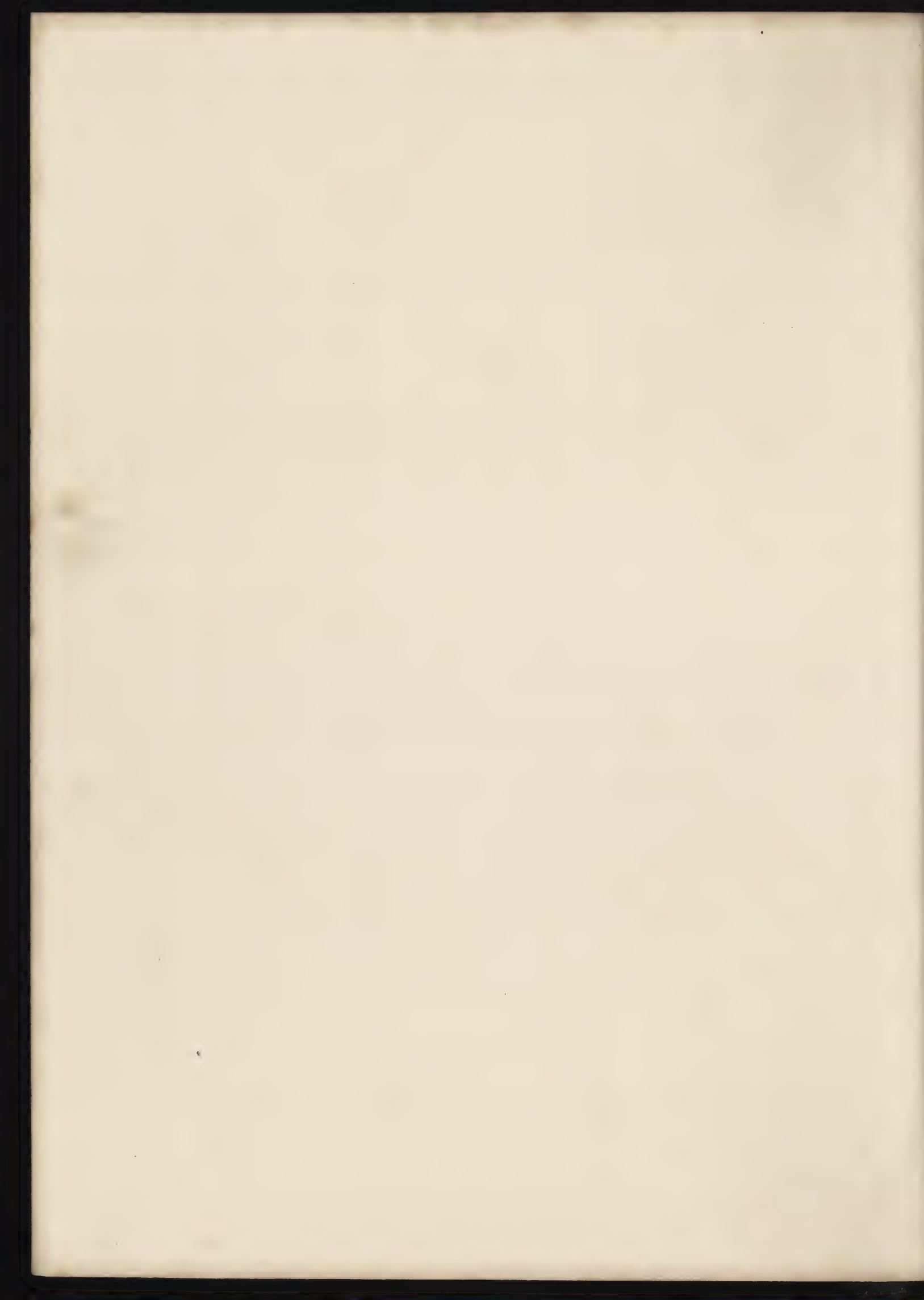
PLATES $\frac{E}{1}$ — $\frac{E}{8}$.

DESIGN FOR A SMALL VILLA IN THE OLD SCOTCH STYLE.

PLATES $\frac{E}{1}$ — $\frac{E}{8}$ contain a Design for a small and commodious villa in the Old Scotch style, illustrated by a Ground Plan, Bedroom Plan, South or Front Elevation, West Elevation, Section, Roof Plan, and Details.

The design is of an ornate and picturesque character, with more irregularity in its features than is to be observed in the generality of villas. This irregularity, however, is rendered very agreeable by the presence of the entrance tower, which, rising considerably higher than all the other features, gives a centre to the group.

The design is not of an expensive nature, its effect being secured more by artistic grouping than by elaborate details. It is shewn to be built of stone, but could be executed in brick with stone finishings. The general roofs to be covered with plain slates, those of the tower and its angle turrets to have bands of ornamental slates as shewn on the Elevations. The windows of all the principal apartments should be glazed with polished plate, and the windows of the porch and staircase with stained glass. The tower, &c., to be finished with ornamental metal-work as shewn.

PLATES $\frac{E}{3}$ — $\frac{E}{4}$.—GROUND PLAN.—On the Ground Floor there are three large entertaining rooms, a convenient butler's pantry, kitchen, scullery, larder, and cook's pantry.

The main entrance is by the porch, situated in the tower, into the hall, from which the dining and drawing rooms open.

The porch measures 7 feet 6 inches by 6 feet 4 inches, and is lighted by a side window and the fanlight over the entrance door. The opening between the porch and the hall should have swinging doors filled with ornamental glass.

At the end of the hall is placed the staircase, which throws out a semicircular feature in the west front. The staircase is well lighted by a large window, which should be filled with stained glass.

The dining room, situated at the south-east corner, measures 20 feet by 16 feet. It

has a slightly projecting window and, opposite, a shallow recess to receive the back of the sideboard.

The drawing room is placed at the south-west corner of the building, with its large bay window looking towards the south. It measures 18 feet 6 inches by 14 feet 6 inches, exclusive of window recess, which is 8 feet 6 inches by 4 feet.

The morning room or breakfast parlor, opening from the end of the hall, measures 17 feet 6 inches by 14 feet. It has a projecting window towards the west, and two convenient cupboards near the fireplace in the north wall.

The butler's pantry is placed between the dining room and kitchen. It is fitted up with cupboards, drawers, sink, and all conveniences.

The kitchen opens from the passage leading from the rear of the hall to the back porch. It is 16 feet long by 15 feet wide.

The scullery, communicating with the kitchen, is 16 feet long by 10 feet wide. It is fitted up with all conveniences, and has a larder and cook's pantry attached.

A large coal-house, ash-pit, and privy are provided in the outbuildings in the court.

Cellars are intended to be sunk, as shewn on the Section, and are to be reached by a stair underneath the principal staircase. The wine cellar should be placed underneath the hall.

The height of the Ground Floor is 11 feet 9 inches.

BEDROOM PLAN.—On the Bedroom Floor there are four large bedrooms, a servants' bedroom, a dressing room, linen closet, and convenient bathroom.

The bedroom over the dining room measures 20 feet by 16 feet, and is lighted by three windows. That over the drawing room measures 18 feet 6 inches by 14 feet 6 inches, and has a convenient dressing room attached. The one over the morning room is 15 feet by 14 feet, and that above the kitchen is 16 feet square. The servants' bedroom measures 16 feet by 12 feet 6 inches.

The linen closet, which is 16 feet long and 6 feet 4 inches wide, is fitted up with shelves and presses.

The bathroom is fitted up with hot, cold, and shower baths, and a marble wash-stand complete. The water-closet is placed at the end of the bathroom, over the kitchen porch.

The height of the Bedroom Floor is 11 feet.

PLATES $\frac{E}{1}$ — $\frac{E}{2}$ contain the South and West Elevations.

In the centre of the South is shewn the entrance tower; on the left, in the gable, is the bay window of the drawing room; on the right of the tower is shewn the projecting window of the dining room.

DESIGN FOR A SMALL VILLA IN THE OLD SCOTCH STYLE.

In the centre of the West Elevation is the semicircular projection of the staircase with its large window. The small opening underneath is to give light to the cellar stair. The window to the left is that of the morning room. The side of the entrance tower is shewn on the right of the elevation.

PLATES $\frac{E}{5}$ — $\frac{E}{6}$ contain the Section and Plan of the Roof. The Section is cut on the line A—B (on the Plans) through the drawing room, staircase, and morning room on the Ground Floor, and the bedrooms over. It also shews the cellar under the morning room and the cellar stair.

PLATES $\frac{E}{7}$ — $\frac{E}{8}$ contain detail drawings of the entrance doorway, projecting windows, main gables, window over bay in front gable, angle turrets of tower, main cornice of side walls, and the chimney heads.

The Details are drawn to the scale of $\frac{3}{4}$ of an inch to 1 foot.
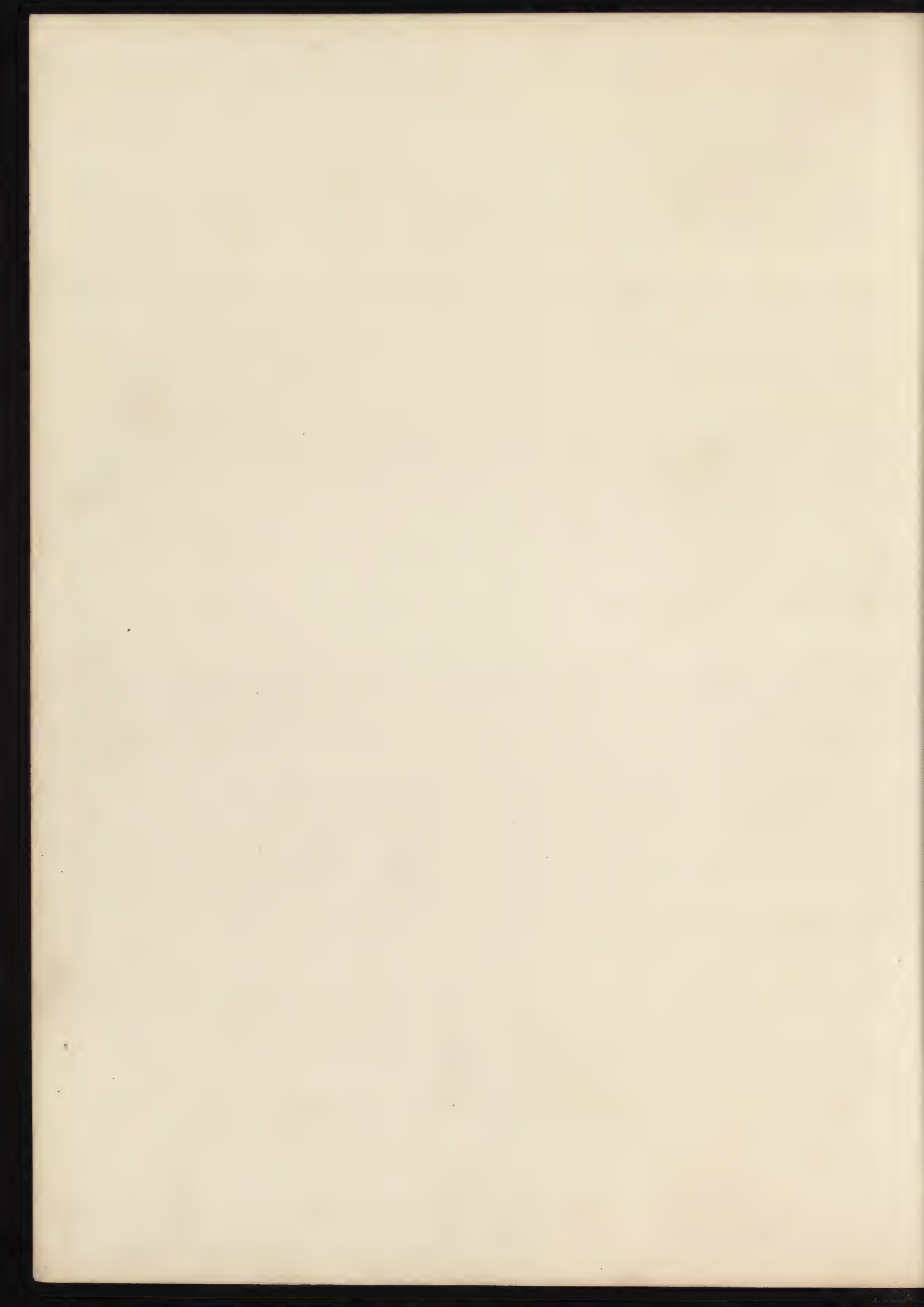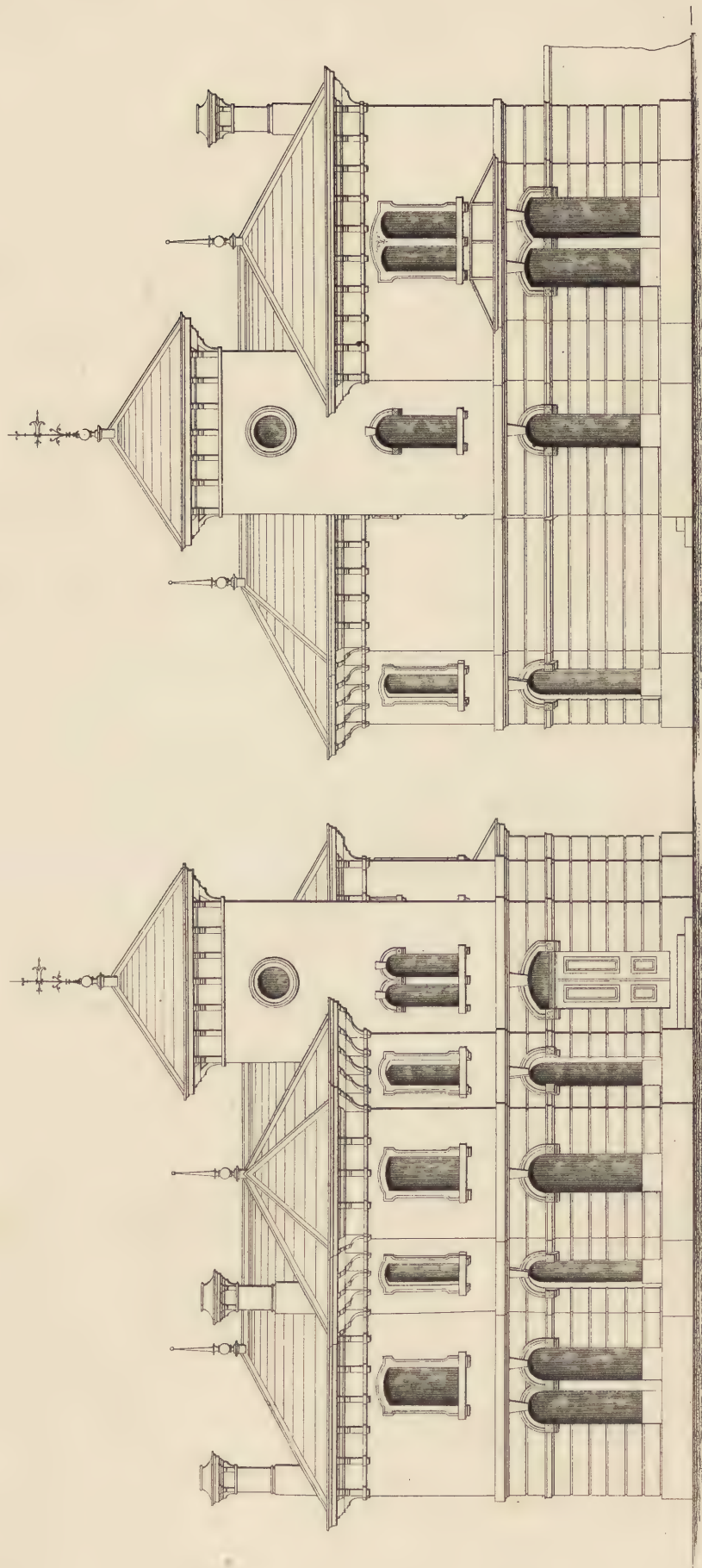
ITALIAN LODGE

FRONT ELEVATION

SIDE ELEVATION

10   5   0   10   20   30   40   50 FEET

ITALIAN LODGE

BEDROOM

BEDROOM
14' × 13'

BATH & W.C.
7'-6" × 7'-6"

LANDING

BEDROOM
14' × 13'

CLOSET

CLOSET

BEDROOM
15' × 13'-3"

B

A

BEDROOM PLAN

PRIVY

ASHES

COALS

COURT

PARLOR
14' × 13'

PORCH
6'-3" × 6'-3"

SCULLERY
11' × 8'

PANTRY

LOBBY

CLOSET

KITCHEN
14' × 13'

SINK

HALL

CHINA CLOSET

PARLOR
14' × 13'-3"

B

A

GROUND PLAN

WILLIAM MACKENZIE, GLASGOW, EDINBURGH & LONDON

10   5   0   10   20   30   40   50 FEET

SECTION at A.-B.

PLAN of ROOF

10   5   0   10   20   30 FEET

CORNICE

AT C-D

CHIMNEY

AT E-F

AT G-H

LOWER FRONT WINDOWS

UPPER WINDOWS
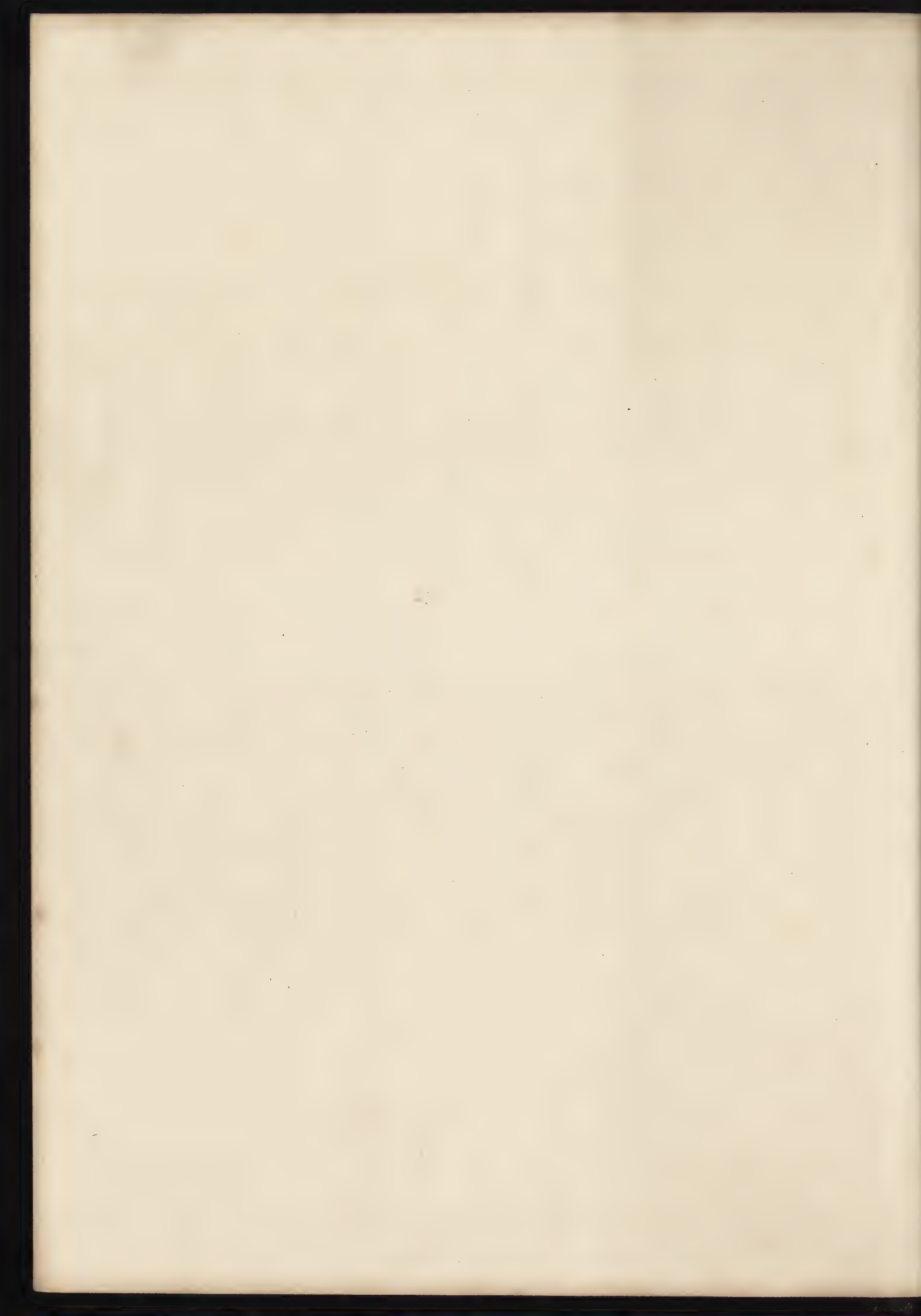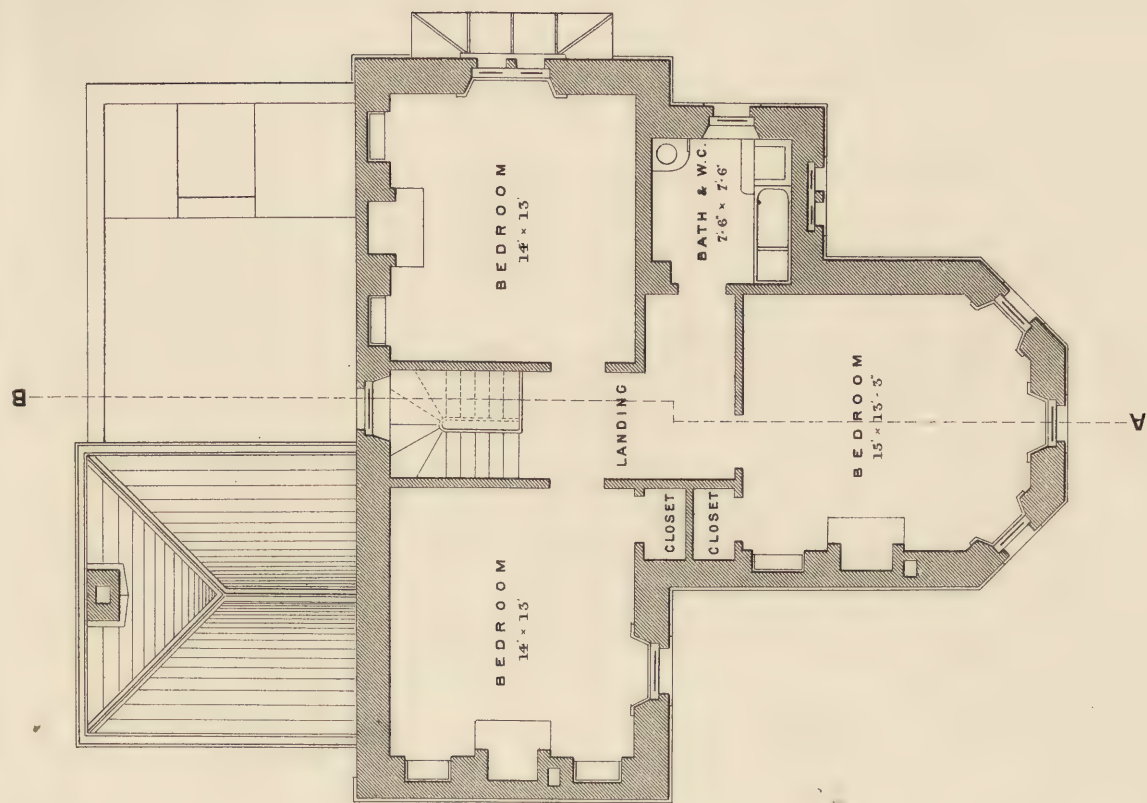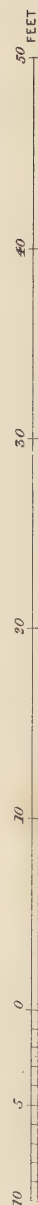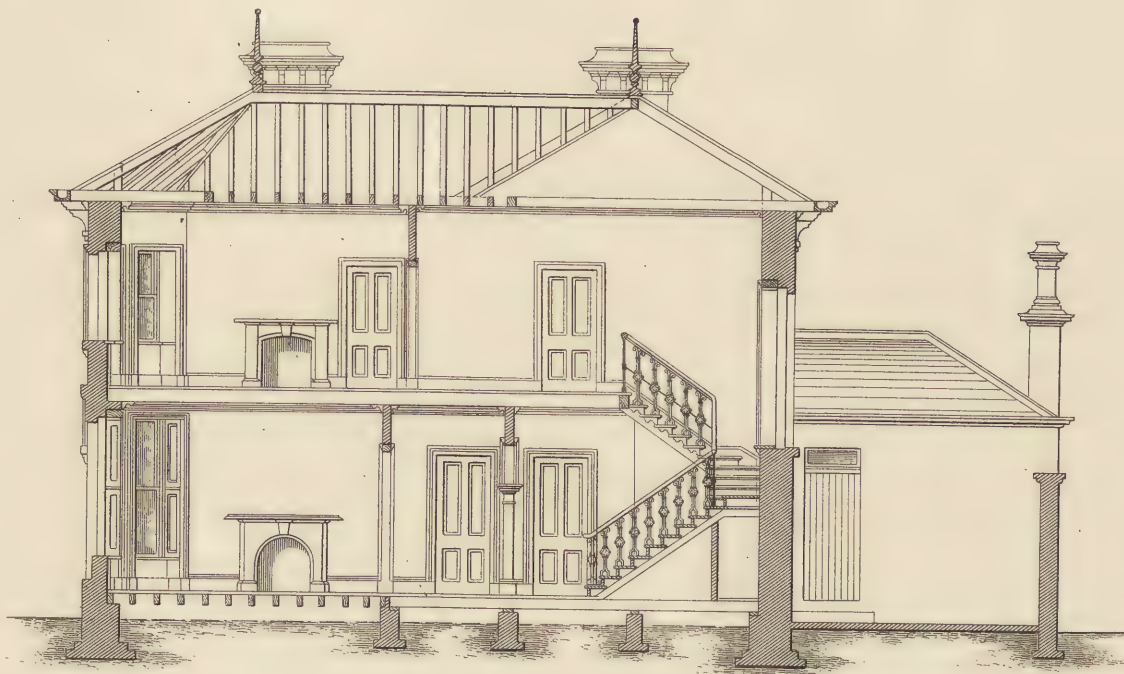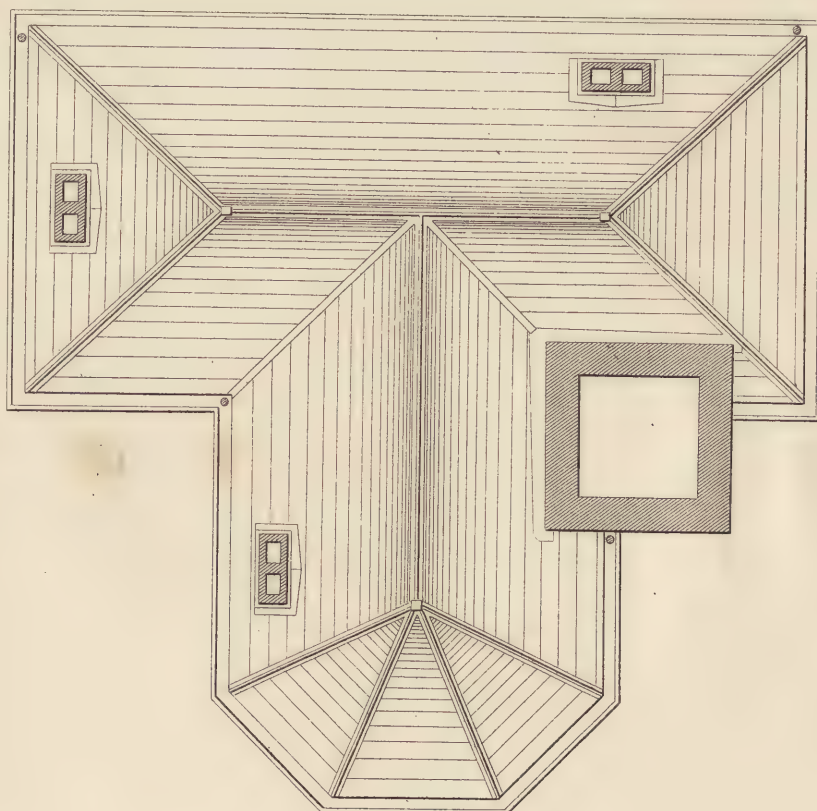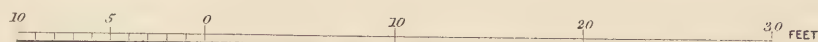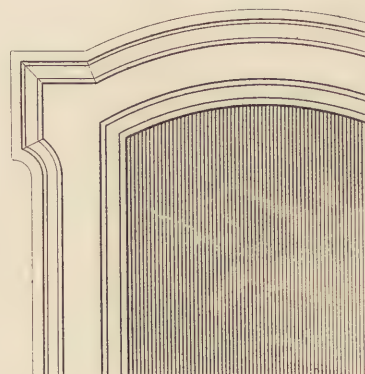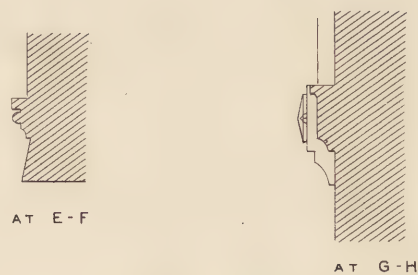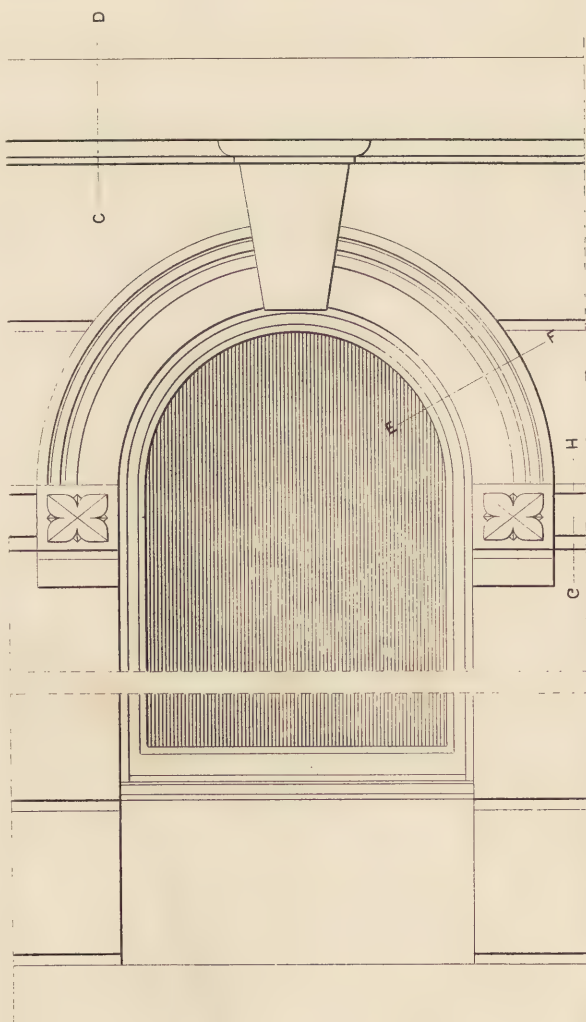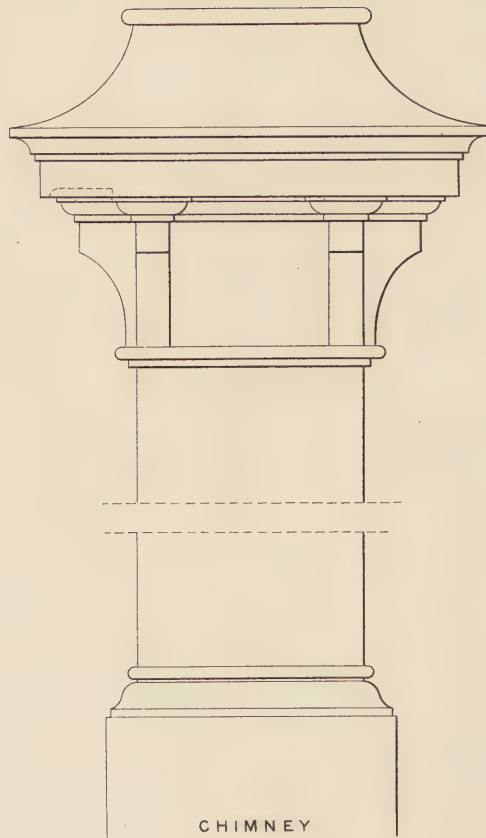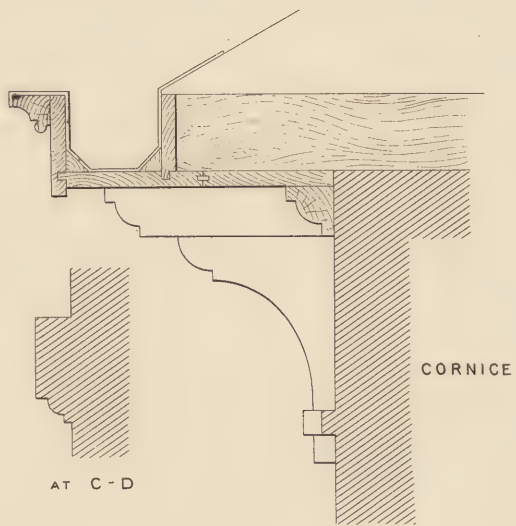
SCALE 3/4 THS TO THE FOOT

PLATES $\frac{F}{1}$ — $\frac{F}{4}$.

DESIGN FOR A LODGE IN THE ITALIAN STYLE.

PLATES $\frac{F}{1}$ — $\frac{F}{4}$ contain a Design for a large and convenient Entrance Lodge in the Italian style; illustrated by a Ground Plan, Bedroom Plan, Front Elevation, Side Elevation, Section, Roof Plan, and Details.

The Design is shewn by the drawings to be built of stone; but, if it is considered advisable, brick may be used for the upper portions of the walls, above the stringcourse.

The lower portions, which are rusticated, should, if brick is introduced, be of stone.

The whole of the finishings of the doors, windows, chimneys, &c., to be of dressed stone.

The main cornice and cornice of tower to be constructed of wood, as shewn in the detail drawing: the neckings of these cornices to be of stone.

The whole of the roofs should be covered with plain slates; and the ornamental finials should be of wood entirely overlaid with lead. The finial of tower to have an iron vane, &c., as shewn.

The whole of the windows in the principal fronts should be filled in with plate glass; the rest of the windows with sheet glass in large panes.

PLATES $\frac{F}{1}$ — $\frac{F}{2}$.—GROUND PLAN.—On the Ground Floor are two parlors, a kitchen, scullery, pantry, china closet, and kitchen offices. To these must be added an entrance porch, hall, and staircase.

The parlors measure respectively 14 feet by 13 feet 3 inches, and 14 feet by 13 feet: both are well lighted. The kitchen measures 14 feet by 13 feet. The scullery, placed in the small back wing, opens off the kitchen lobby; it is 11 feet long by 8 feet wide, and is fitted up with all conveniences.

The entrance porch is 6 feet 3 inches square, and has a large window in its side to give light to the hall. There is also a large window in the staircase, which will likewise light the hall through the open archway.

DESIGN FOR A LODGE IN THE ITALIAN STYLE.

The china closet opens off the hall, and there is a small closet placed underneath the stairs; the pantry opens off the kitchen lobby.

A coal-house, ash-pit, and privy are provided in an outbuilding in the court.

The height of the Ground Floor is 10 feet.

BEDROOM PLAN.—On the Bedroom Floor there are three good rooms, measuring respectively, 15 feet by 13 feet 3 inches, 14 feet by 13 feet, and 14 feet by 13 feet. The largest bedroom and the one over the kitchen have wardrobe closets attached. All the bedrooms are fitted with fireplaces, and are well lighted. Over the entrance porch is placed a bathroom fitted with bath, water-closet, and wash-stand complete.

The height of the Bedroom Floor is 9 feet 6 inches.

PLATES $\frac{F}{3}$ — $\frac{F}{4}$ contain the Section, Roof Plan, and Details.

The Section is cut on the line A—B. It shews the principal parlor, hall, and staircase on the Ground Floor, and the largest bedroom and the landing on the Bedroom Floor. On the left of the Section is shewn the side of the small back wing.

The Details are drawn to the scale of $\frac{3}{4}$ of an inch to the foot.

PLATE 6

GAMEKEEPERS COTTAGE

SECTION at A. B.

END ELEVATION

ELEVATION

10   5   0   10   20   30 FEET

GAMEKEEPERS COTTAGE

ATTIC PLAN

ATTIC
14′ × 11′

LANDING

ATTIC
14′ 0″ × 12′ 3″

B

A

GROUND PLAN

PARLOR
14′ × 11′

SCULLERY

SINK

ASHES

PRIVY

CLOSET

LOBBY

KITCHEN
14′ × 10′

PORCH

B

A

10 5 0 10 20 30 FEET
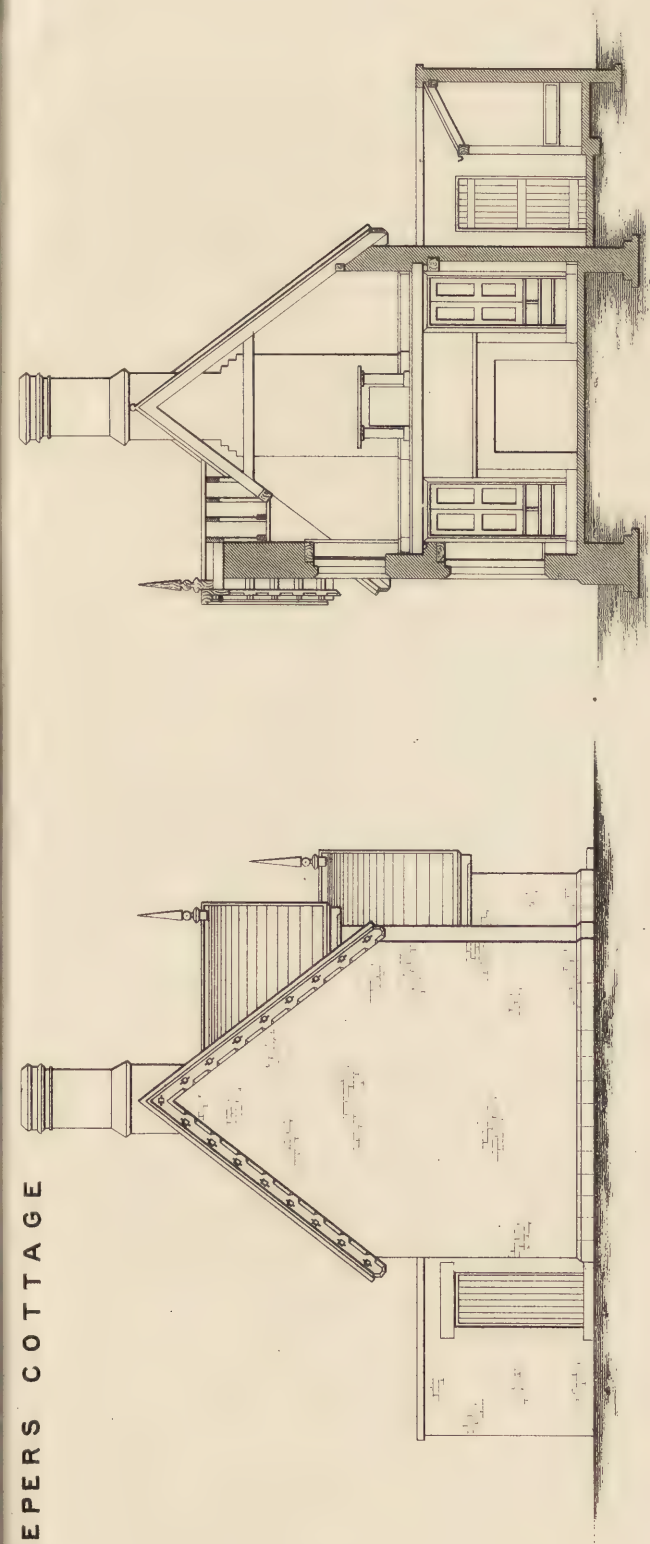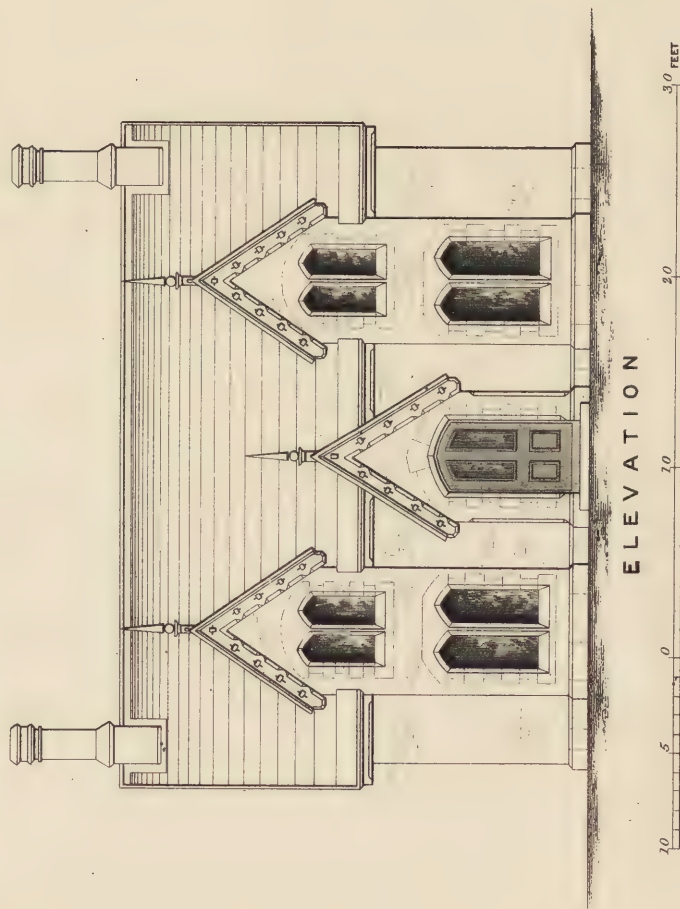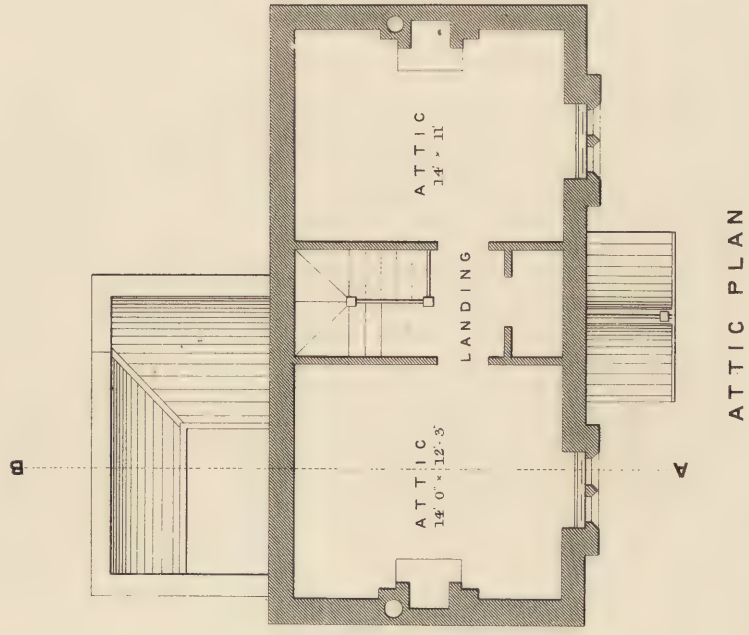
PLATES $\frac{G}{1}$ — $\frac{G}{2}$.

DESIGN FOR A GAMEKEEPER'S COTTAGE.

PLATES $\frac{G}{1}$ — $\frac{G}{2}$ contain Ground Plan, Attic Plan, Front Elevation, End Elevation, and Section of a small cottage, suitable for the residence of a Gamekeeper, Gardener, or Forester on an estate.

It is shewn in the drawing to be executed in brick, with the base-course, finishings of the doors and windows, and the caps and bases of the chimney heads, in stone. The roofs, projecting over the gables, are finished with stop-chamfered barge boards as shewn.

The Ground Plan comprises a parlor, kitchen, scullery, and closet. An ash-pit and privy are provided in an outbuilding. The parlor measures 14 feet by 11 feet, and has a small cupboard opening from it. The kitchen measures 14 feet by 10 feet, exclusive of cupboard recesses, and communicates with the scullery by a small lobby, off which opens a convenient closet or pantry. The two recesses beside the kitchen fireplace are fitted with cupboards and drawers as shewn in the Section.

The front entrance door is enclosed in a neat projecting porch, with an open archway. The upper panels of the door should be of embossed glass, to give light to the lobby.

The height of the Ground Floor is 8 feet 4 inches.

On the Upper Floor there are two good attic bedrooms, measuring respectively 14 feet by 12 feet 3 inches, and 14 feet by 11 feet. Both these rooms are 8 feet 4 inches high, have fireplaces, and are well lighted. They both open from the landing at the head of the stairs, which, together with the staircase, is lighted by a skylight in the roof over.

The Section on the line A—B cuts the kitchen, yard, and privy, on the Ground Floor, and the attic bedroom over.
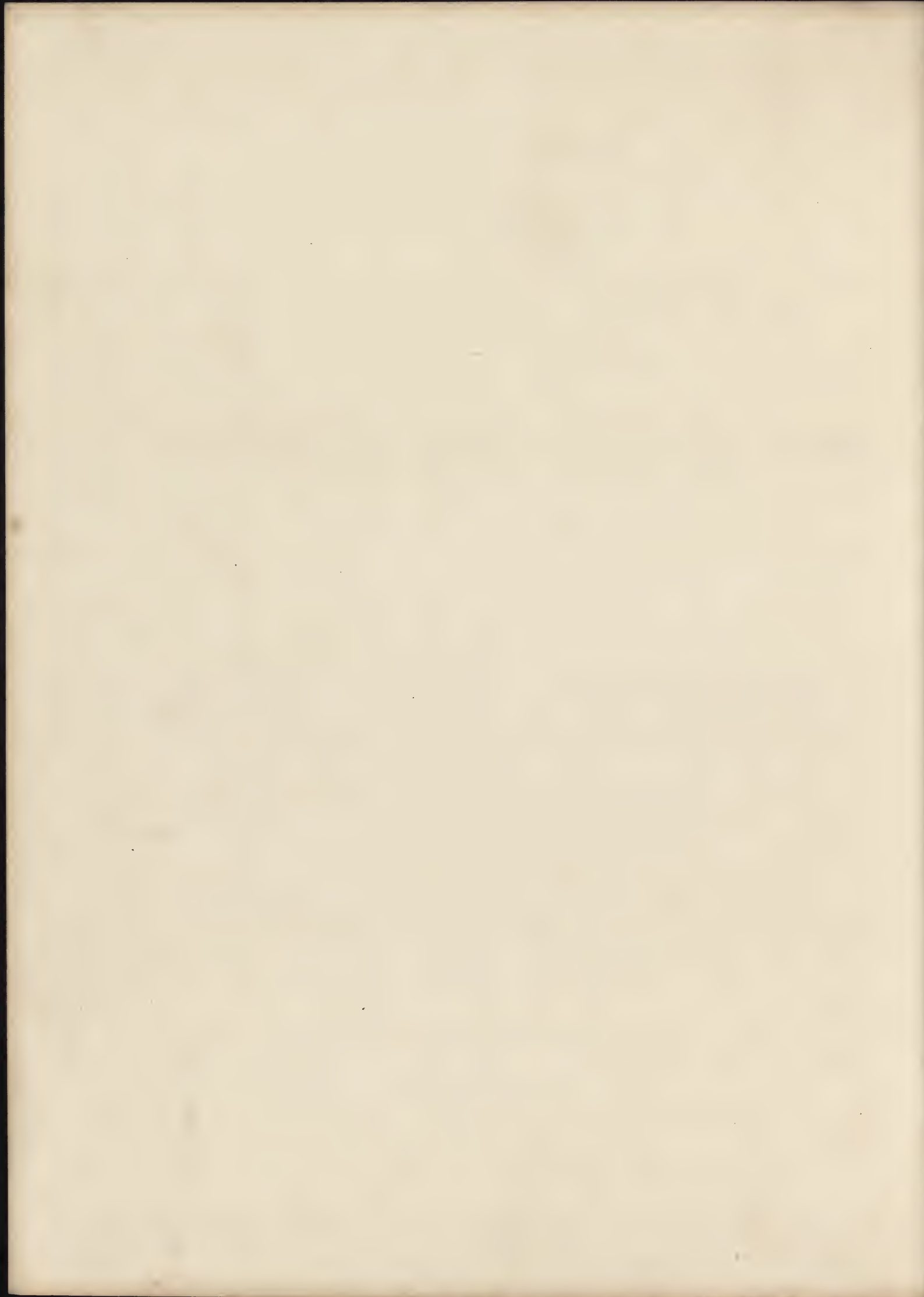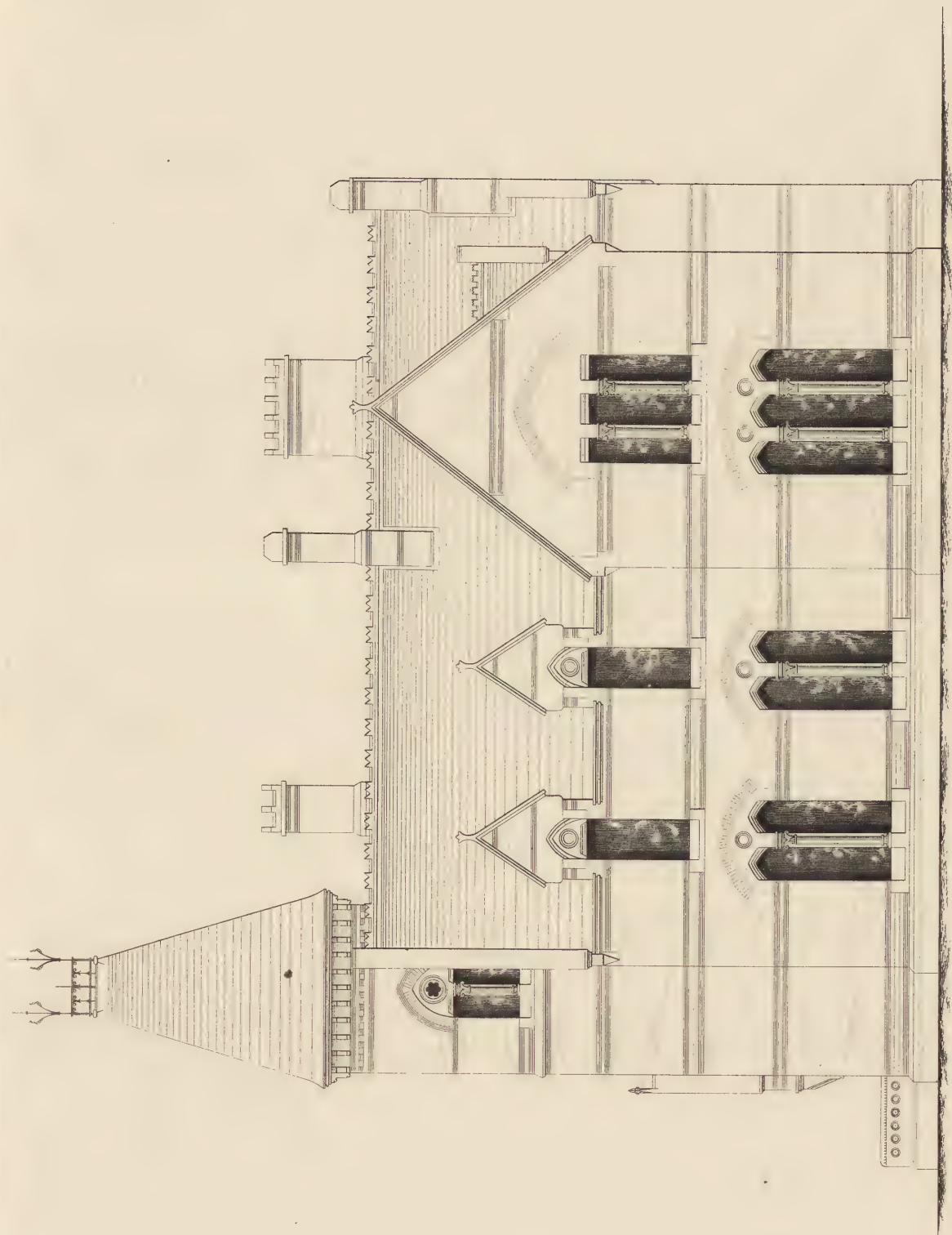
WEST ELEVATION
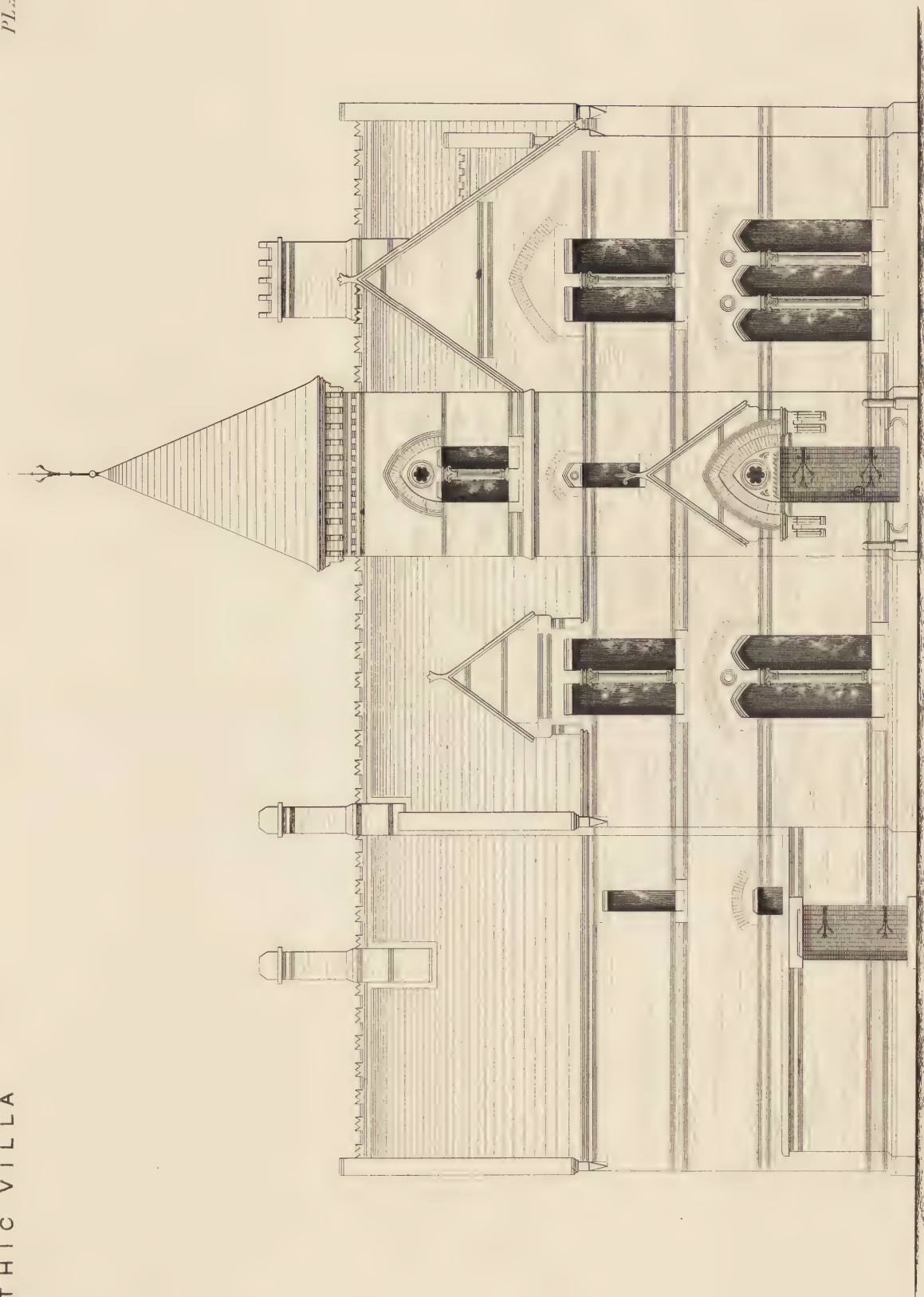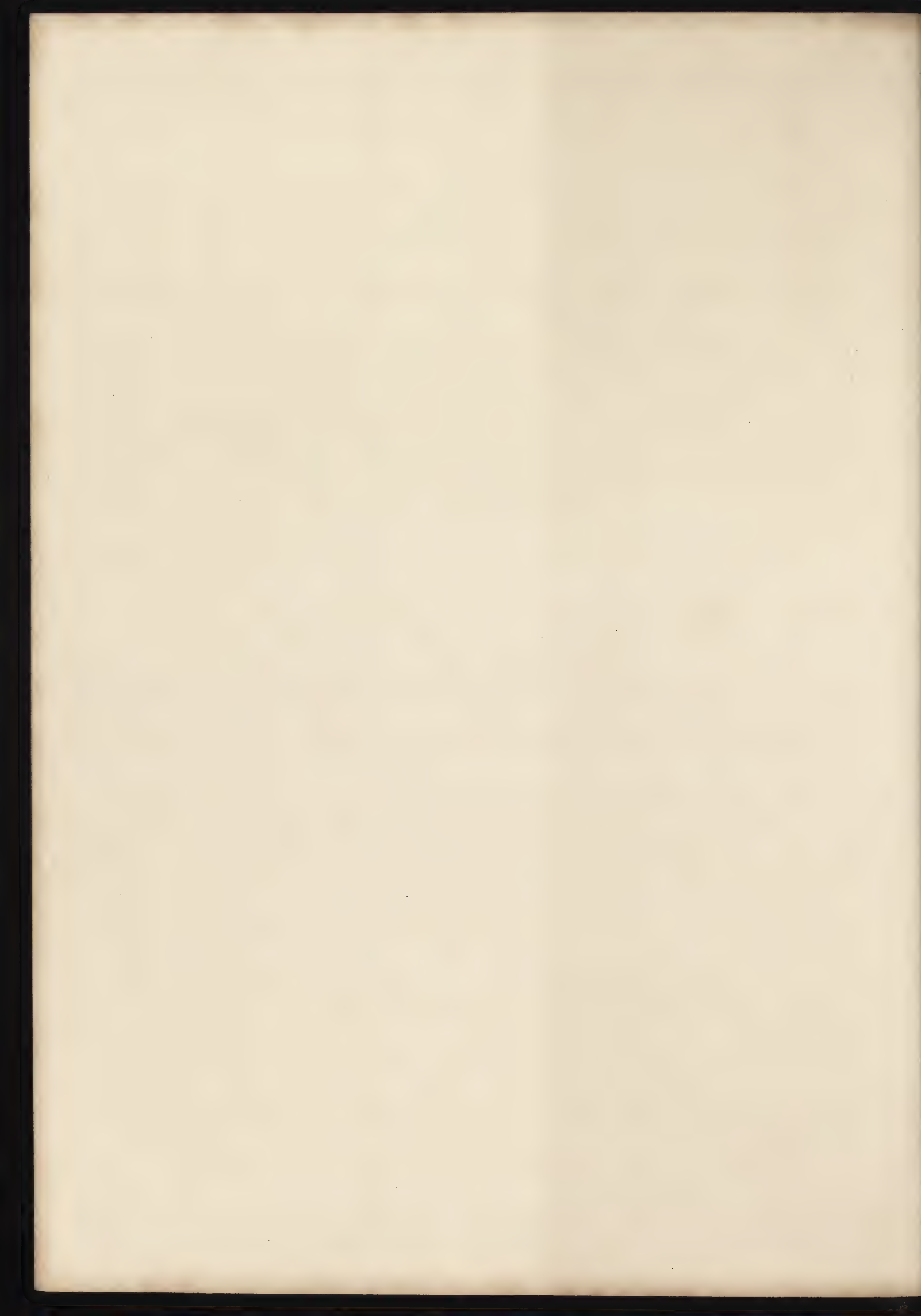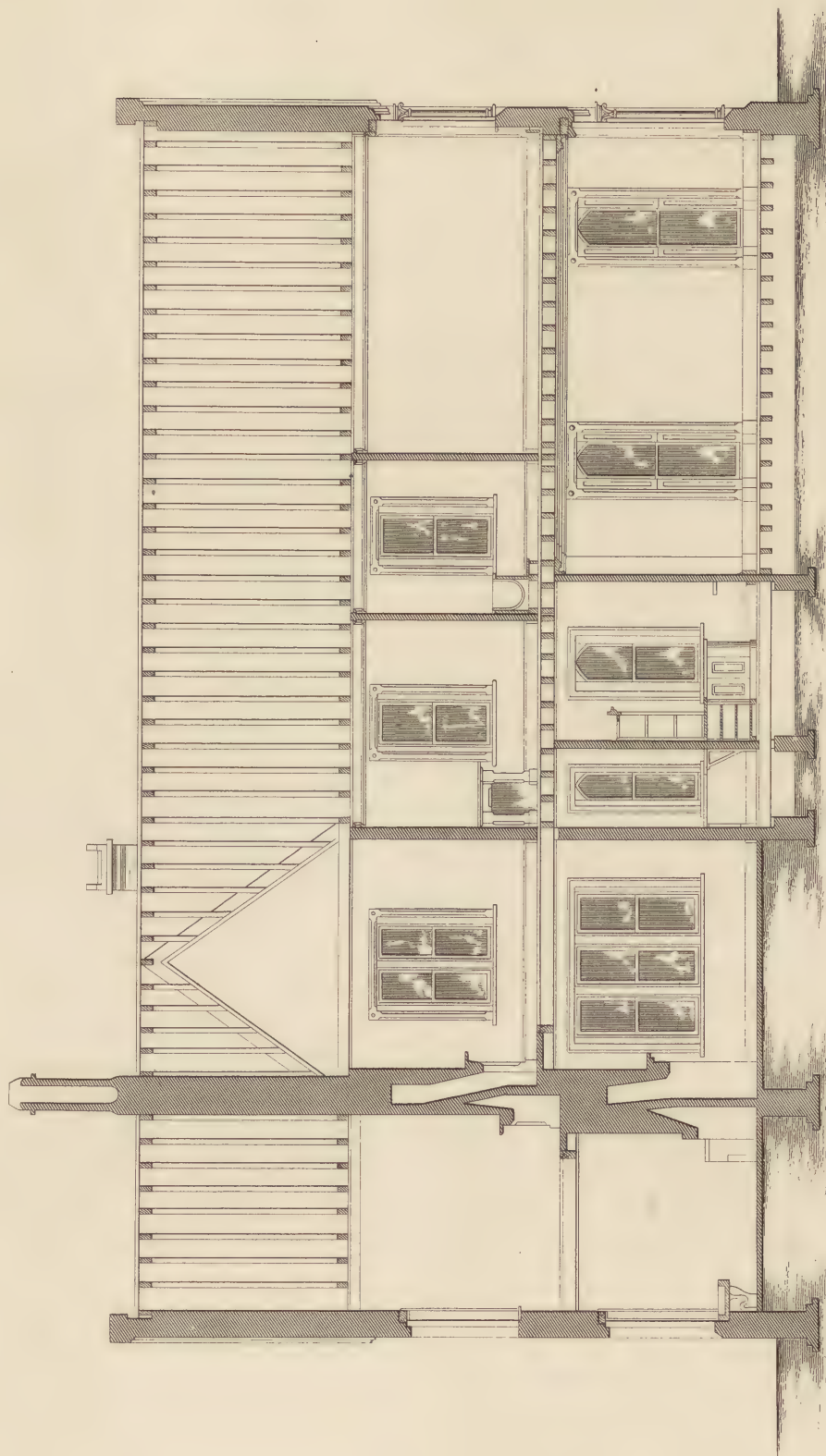
40 FEET

GOTHIC VILLA

SOUTH ELEVATION

SECTION AT A.B.

10   5   0   10   20   30   40   50 FEET

WILLIAM MACKENZIE, GLASGOW EDINBURGH & LONDON

PLATE 7

GOTHIC VILLA

Trap

PLAN of ROOF

10   5   0   10   20   30   40   50 FEET

PRIVY

ASHES

COALS

SCULLERY

17. 0" × 11. 0"

SINK

PORCH

COURT

PANTRY

KITCHEN

19. 0" × 14. 0"

MORNING ROOM

17. 0" × 15. 0"

STORE ROOM

12. 0" × 4. 6"

Cupboards

PASSAGE

STAIRCASE

BUTLERS PANTRY

12. 0" × 9. 0"

PORCH

HALL

DINING ROOM

24. 0" × 17. 0"

DRAWING ROOM

24. 0" × 16. 0"

GROUND PLAN

10   5   0   10   20   30   40   50 FEET

A

SERVANTS ROOM

HOUSE
MAIDS
CLOSET

BED ROOM
16. 0" × 14. 0"

BED ROOM
17. 0" × 15. 0"

PASSAGE

BED ROOM
12. 0" × 2. 0"

DRESSING ROOM

LANDING

BATH & W.C.
12. 0" × 8. 6"

BED ROOM
24. 0" × 16. 0"

BED ROOM
18. 0" × 17. 0"

BED ROOM PLAN

10 5 0 10 20 30 40 50 FEET
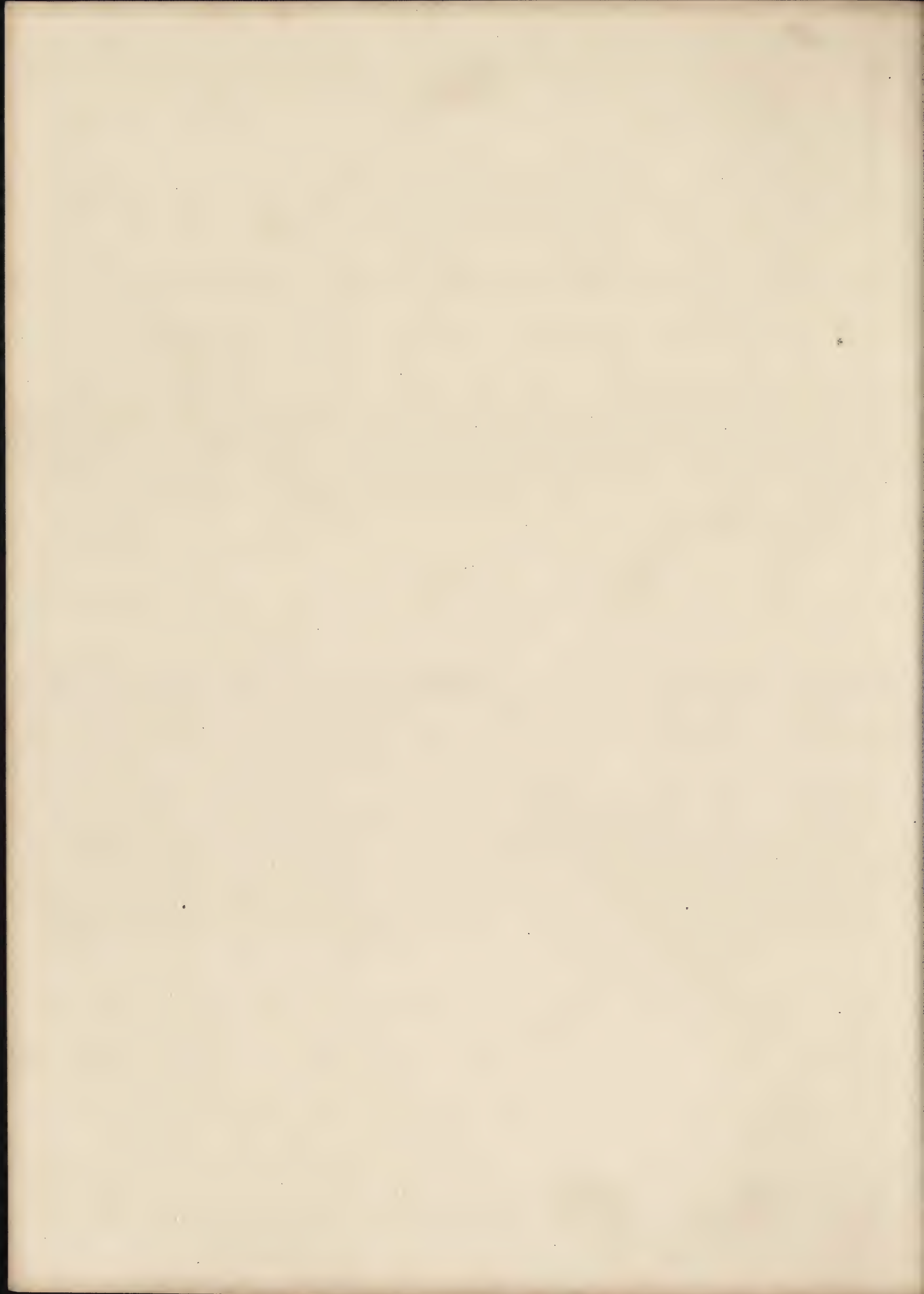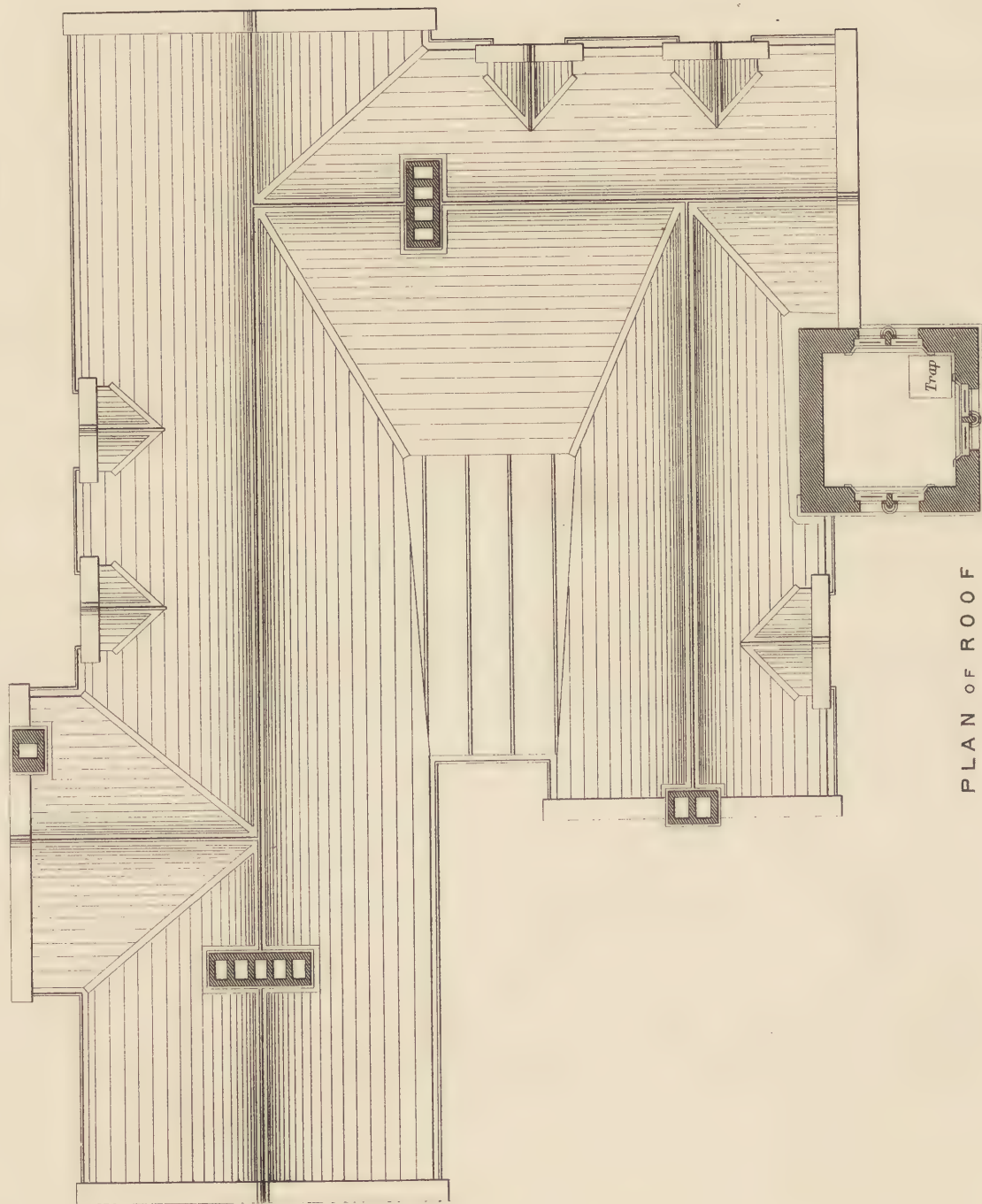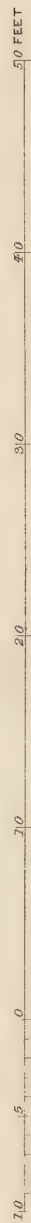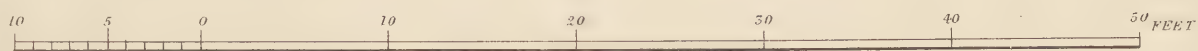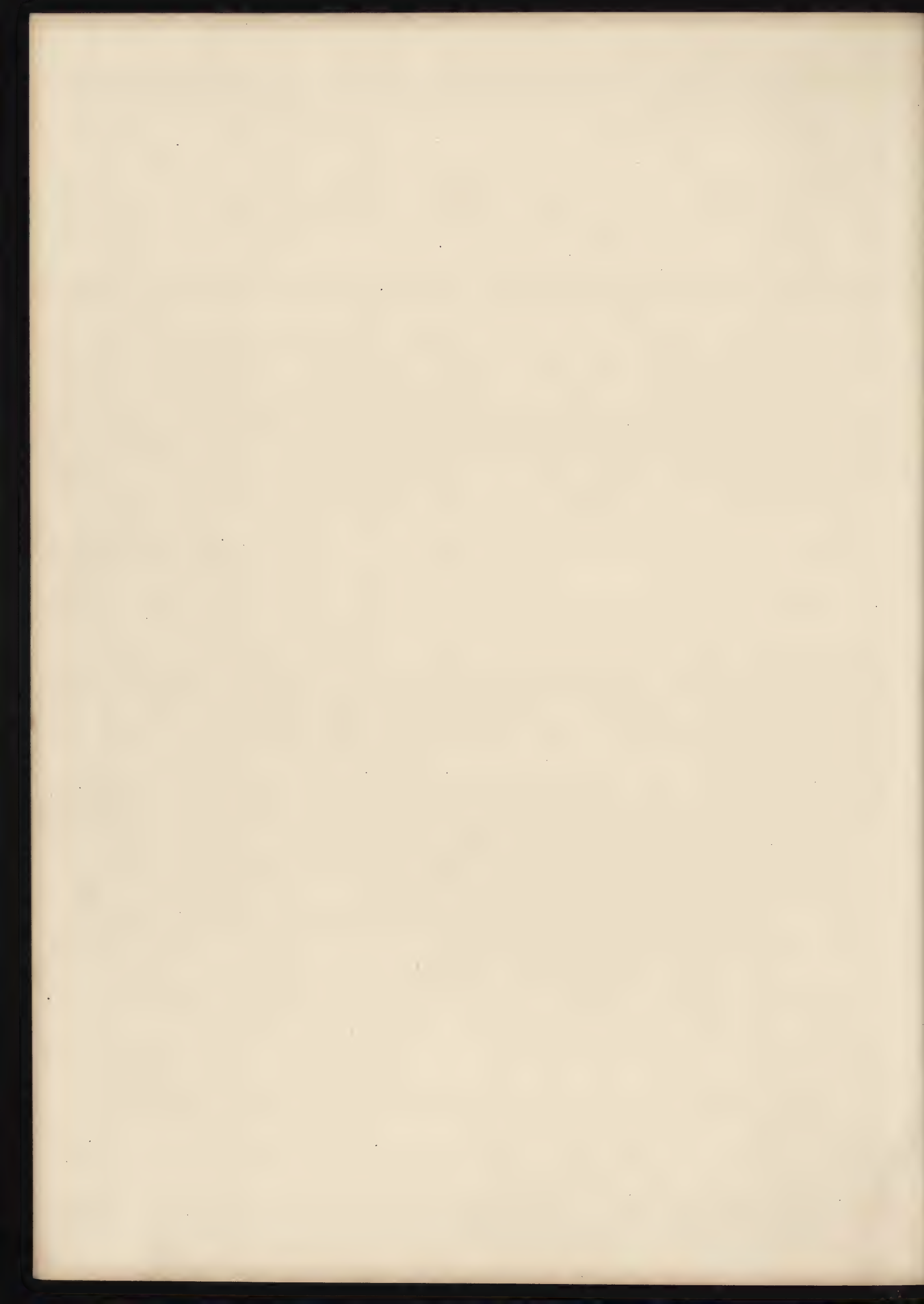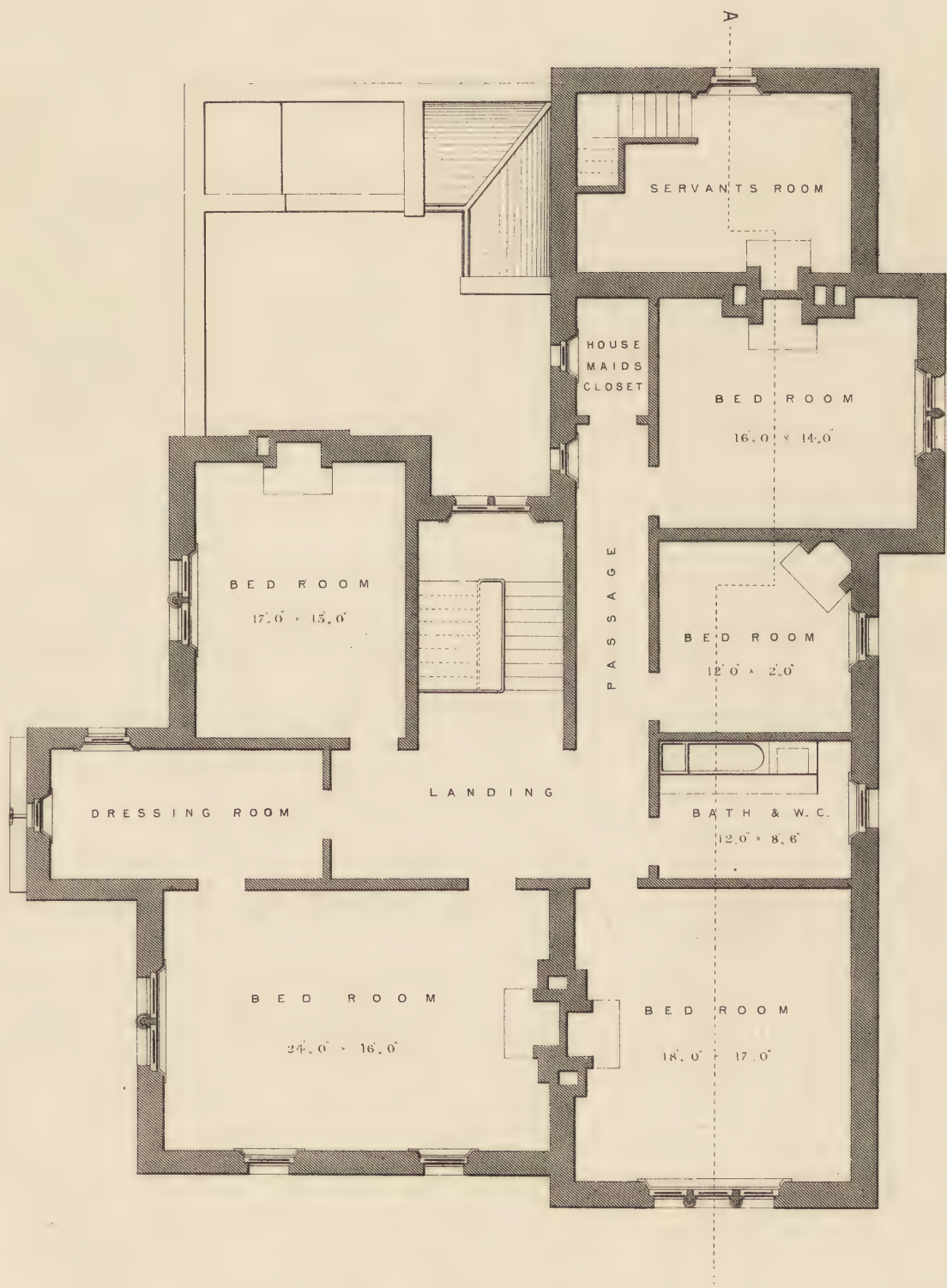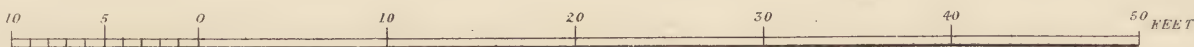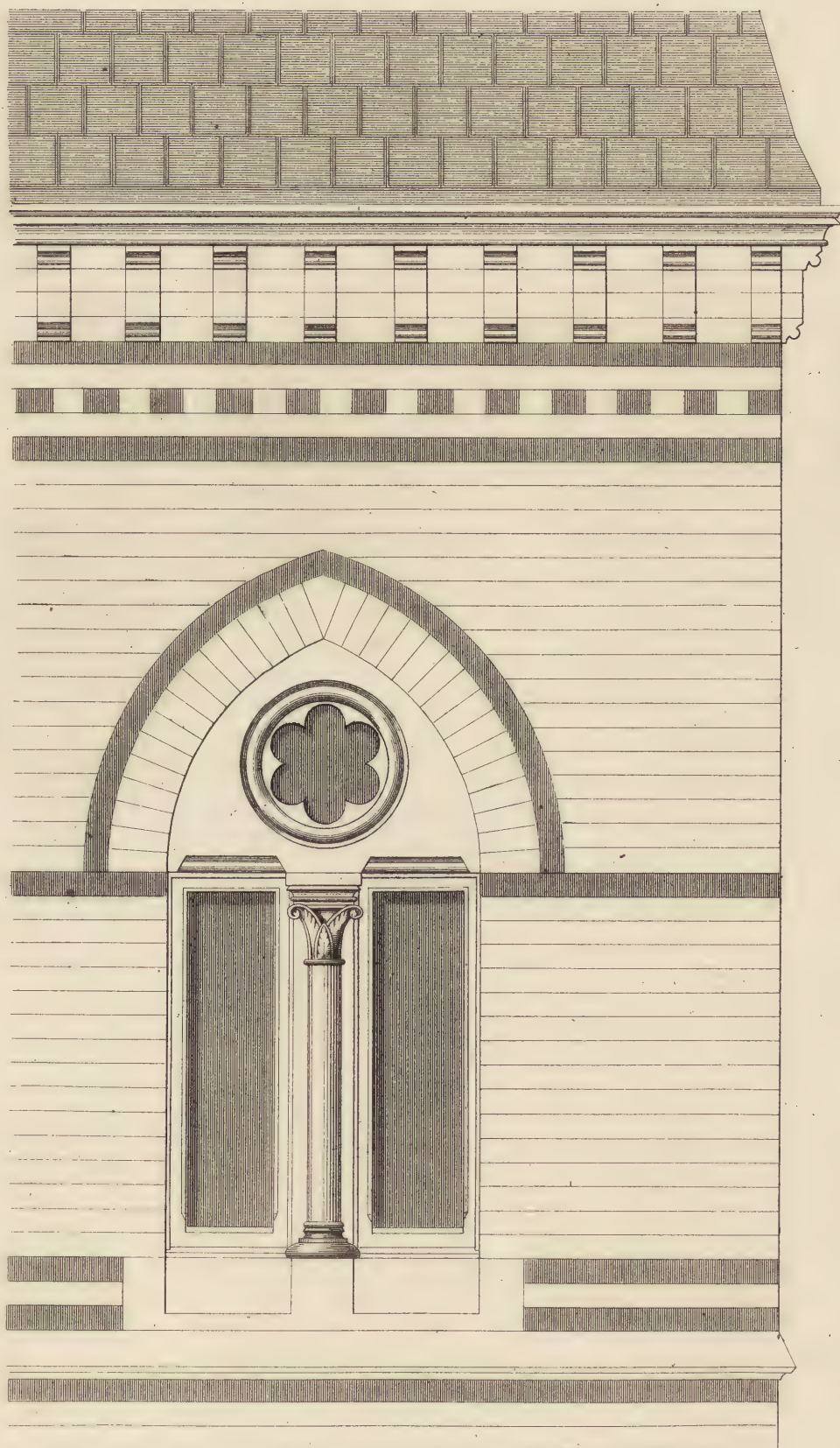
DETAILS

UPPER PART OF TOWER.

D E T A I L S

DINING ROOM CHIMNEY PIECE.

DRAWING ROOM CHIMNEY PIECE.

DRAWING ROOM WINDOW.
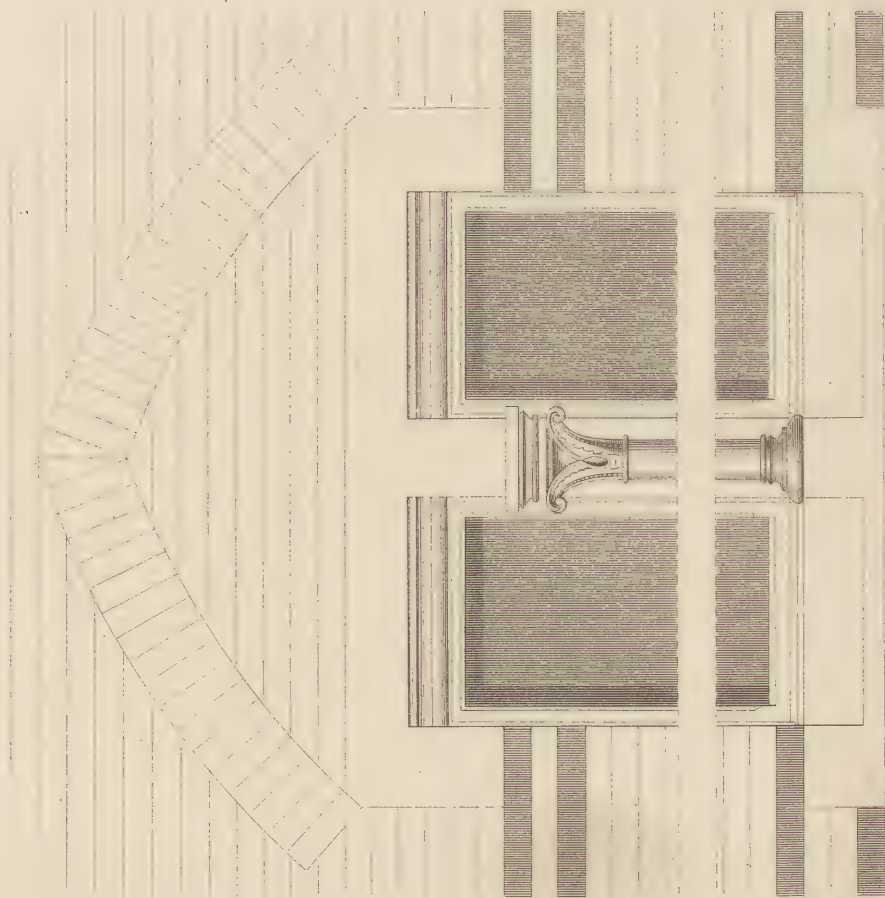
WINDOW IN BEDROOM FLOOR.

INS
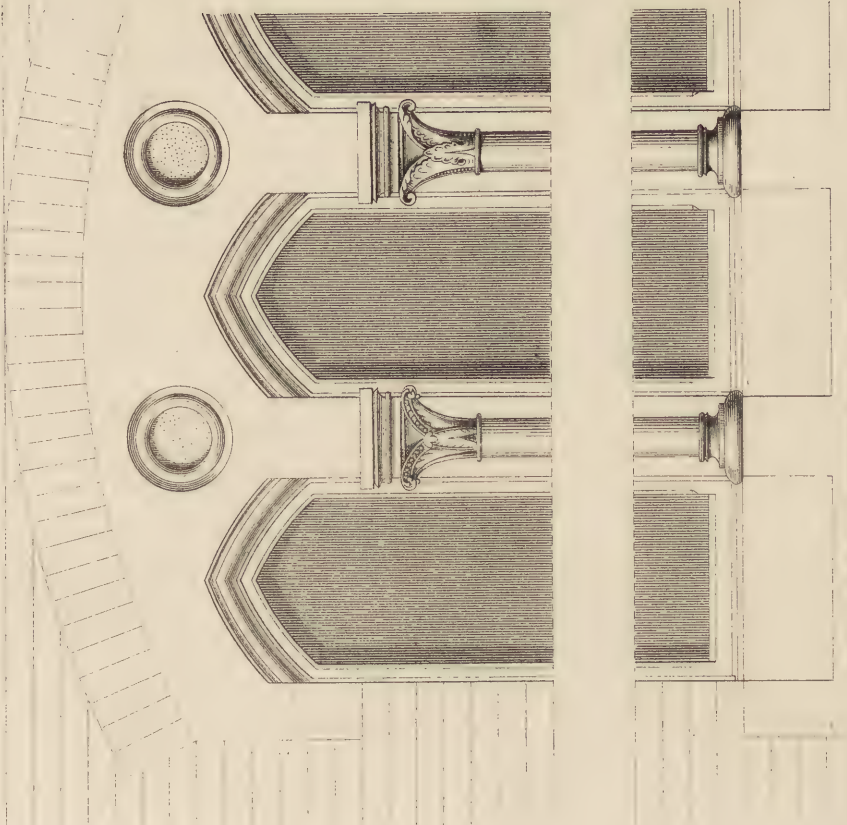
FEET

DETAILS

FRONT DOORWAY

INS |12 6 0 1 2 3 4 5 6 7 8| FEET
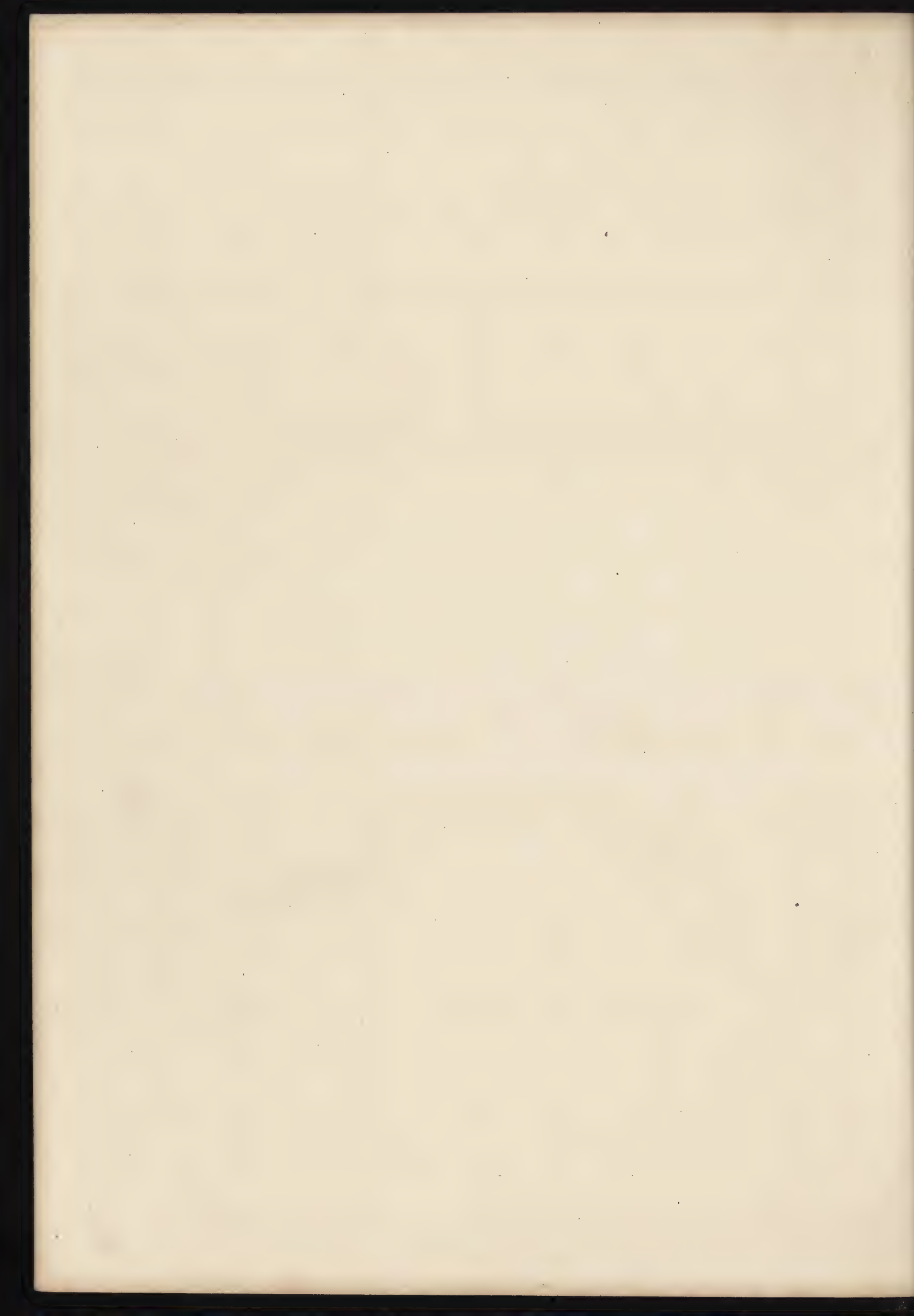
DETAILS
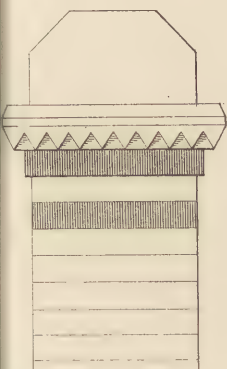
CHiMNEY
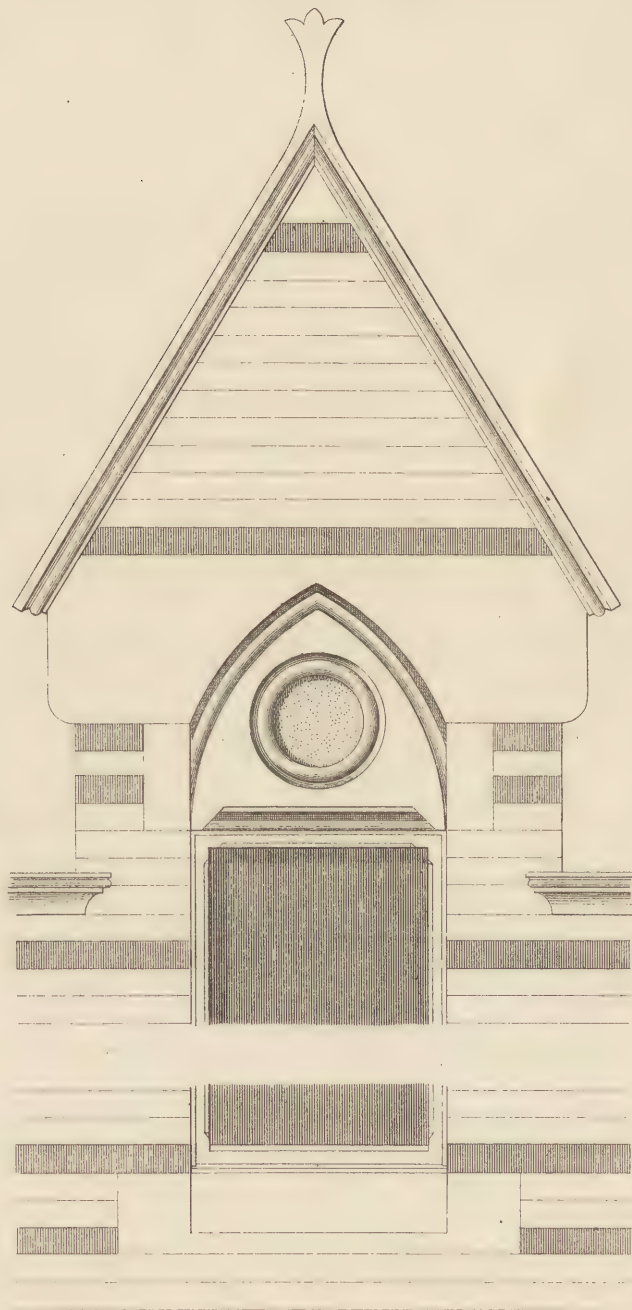
FINIAL &c. OF TOWER

DORMER WINDOW
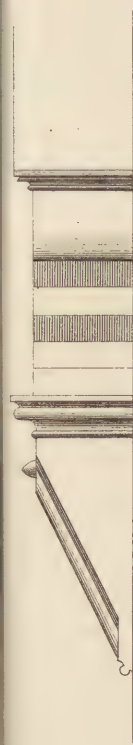
E OF BRACKETS

SIDE SEATS

WINDOW IN TOWER

INS 12 6 0 1 2 3 4 5 6 7 8 FEET
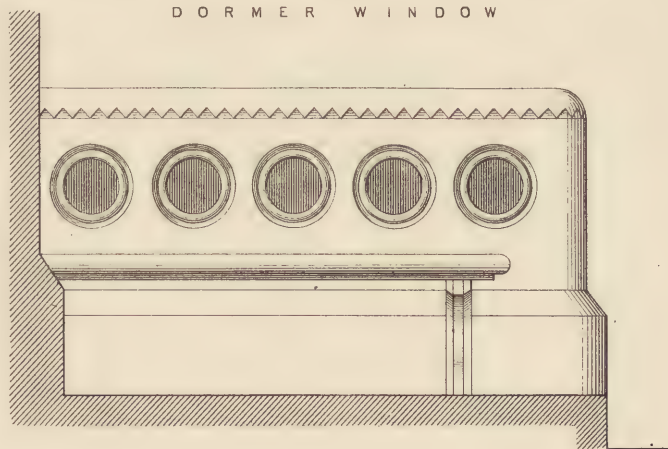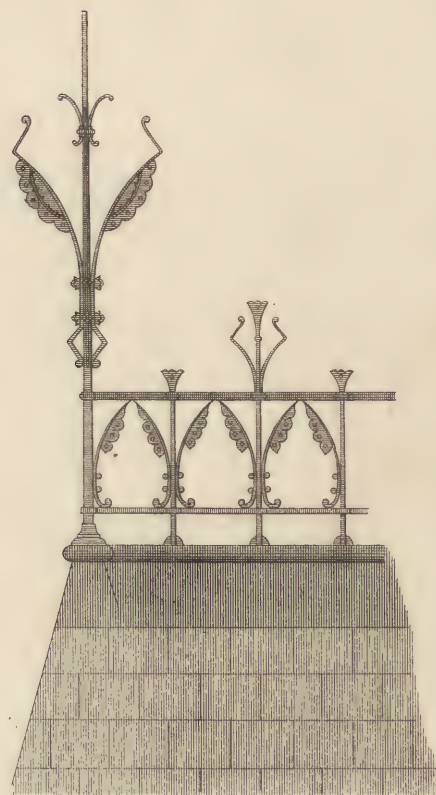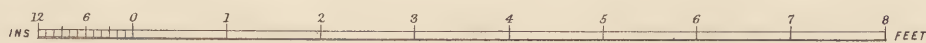
PLATES $\frac{H}{1}$ — $\frac{H}{6}$.

DESIGN FOR A GOTHIC VILLA.

PLATES $\frac{H}{1}$ — $\frac{H}{6}$ contain a design for a commodious Villa in the Gothic style, illustrated by a Ground Plan, Bedroom Plan, Front Elevation, Side Elevation, Section, and Roof Plan. The drawings shew the Villa to be built of brick, with stone finishings. The bands on the walls and chimneys which are shaded represent the portions to be executed in black brick, if red is used for the exterior; but if the house is built of yellow brick, the bands should be red, as black would have too striking an effect. Stone is to be used for the weathering of the base-course, the steps, seats, and tympanum of entrance doorway, and the brackets, spur-stones, and factable of canopy over; the cills, mullions, lintels, and tympani of windows; the spur-stones and factables of gables and dormers; the string-course and upper portion of the cornice of tower; the weatherings and cappings of the chimneys; and the finishings of the court wall, out-buildings, and porch.

The openings of all the windows are of simple and unbroken forms, so as to admit of sashes being used. These may be filled with plate or ornamental leaded glass, as taste may direct. The window of vestibule in tower, the sixfoil in tympanum of entrance doorway, and the staircase window, should be filled with stained glass. The roofs may be covered with plain or banded slating, and have an ornamental ridge cresting. The roof of the tower to be terminated with a wrought iron ridge railing as shewn, painted and gilded.

PLATES $\frac{H}{5}$ — $\frac{H}{6}$.—GROUND PLAN.—On the Ground Floor there are three reception-rooms, a kitchen, scullery, butler's pantry, store-room, cook's pantry, and the necessary outbuildings. The dining-room measures 24 feet by 17 feet, and has a service wicket from the butler's pantry, on one side of the sideboard recess. The drawing-room measures 24 feet by 16 feet, and is well lighted by three large windows. The morning-room measures 17 feet by 13 feet. The kitchen and pantry accommodation, while in close

proximity to the dining-room, is conveniently separated from the public portion of the house by a passage opening from the hall.

The height of the Ground Floor is 11 feet 6 inches.

BEDROOM PLAN.—On the Bedroom Floor there are six bedrooms, including the servants' bedroom, a dressing-room, bath-room and water-closet, and linen-closet. The principal bedrooms measure respectively 24 feet by 16 feet; 18 feet by 17 feet; 16 feet by 14 feet; 17 feet by 13 feet; and 12 feet by 12 feet.

The height of the Bedroom Floor is 10 feet 6 inches.

PLATES $\frac{H}{1}$ — $\frac{H}{4}$ contain the Front Elevation, Side Elevation, Section, and Roof Plan. The Section is cut on the line A—B through the dining-room, butler's pantry, store-room, kitchen and scullery, on the Ground Floor, and through the three bedrooms, servants' room, and bath-room, on the Bedroom Floor.

DOUBLE COTTAGE

A

ELEVATION

PRIVY | ASHES | COALS

KITCHEN
12·3″ × 11·0″

KITCHEN
12·3″ × 11·0″

COALS | ASHES | PRIVY

COURT

COURT

LOBBY

LOBBY

PANTRY | PANTRY

PARLOR
15·6″ × 13·0″

PARLOR
15·6″ × 13·0″

LOBBY | LOBBY

GROUND PLAN

10   5   0   10   20   30   40   50 FEET
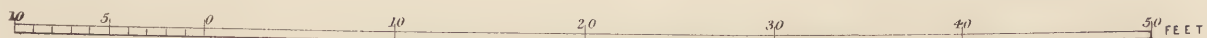
SECTION at A. B.

BEDROOM
12' 8" × 11' 0"

BEDROOM
12' 3" × 11' 0"

CLOSET

CLOSET

BEDROOM
15' 6" × 13' 6"

BEDROOM
15' 6" × 13' 0"

CLOSET

CLOSET

BEDROOM PLAN

10 5 0 10 20 30 40 50 FEET
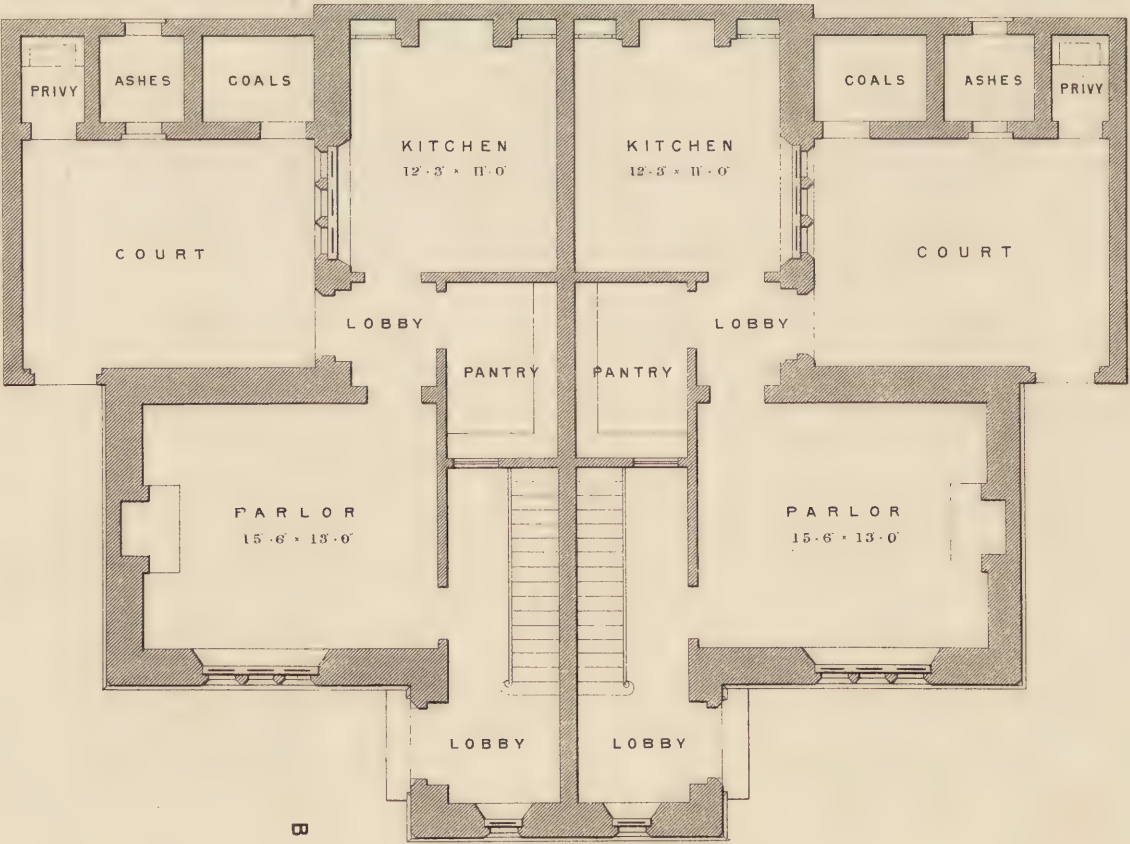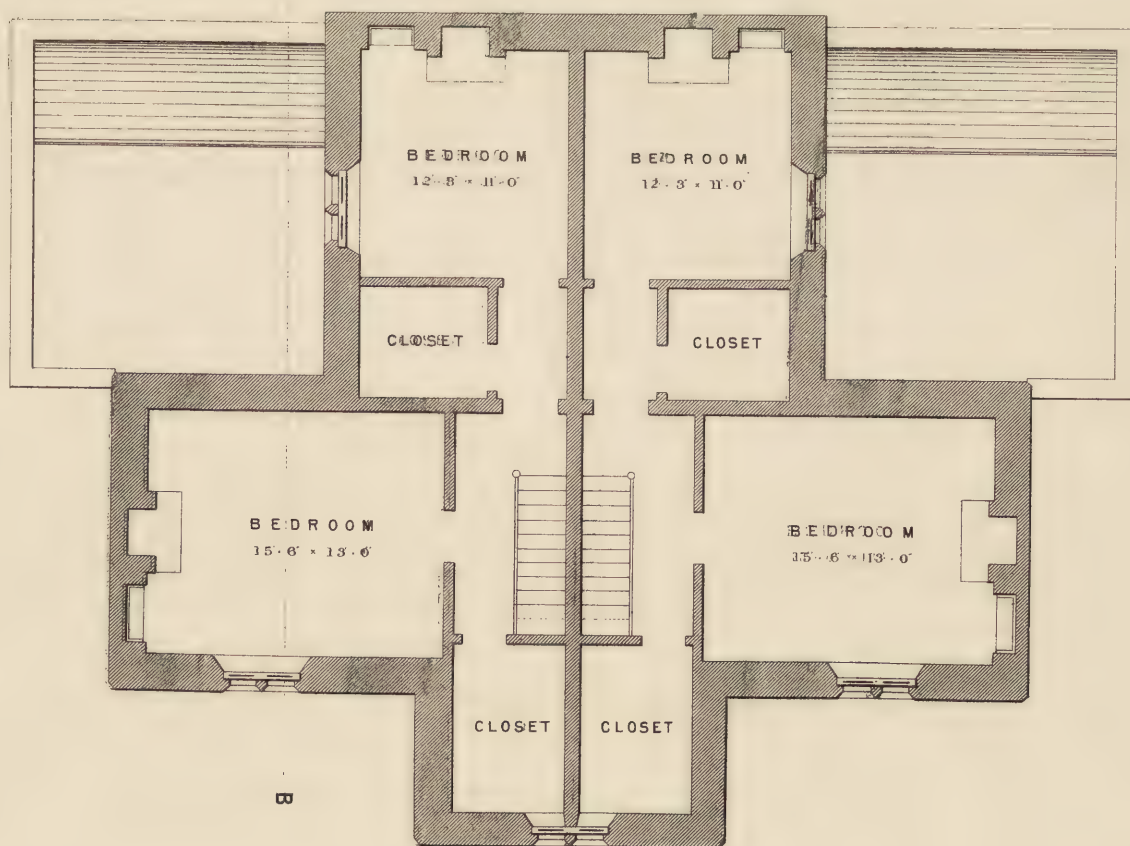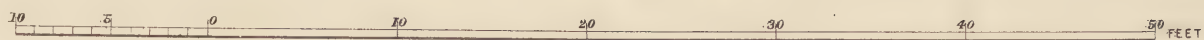
PLATES $\frac{1}{1}$ — $\frac{1}{2}$.

DESIGN FOR A DOUBLE COTTAGE.

PLATES $\frac{1}{1}$ — $\frac{1}{2}$ contain a design for a Double Cottage suitable for the better class of labourers, or for farm officers on an estate. It is illustrated by a Ground Plan, Bedroom Plan, Elevation, and Section.

The cottages are shewn to be built of stone; but they may be readily executed in brick, and with a good effect, the finishings to the doors, windows, &c., being of stone.

GROUND PLAN.—Each cottage has, on the Ground Floor, a parlor, kitchen, and large pantry, with convenient front and back lobbies. The parlor measures 15 feet 6 inches by 13 feet, and the kitchen measures 12 feet 3 inches by 11 feet. The latter has a large fireplace and two cupboards. The pantry is fitted with shelves, and is lighted by a borrowed light from the front lobby.

A coal-house, ash-pit, and privy are provided in the court.

The height of the Ground Floor is 9 feet.

BEDROOM PLAN.—Each cottage has, on the Upper Floor, two good bedrooms, a bed closet over the front lobby, and a convenient lumber closet over the back lobby. Both the bedrooms have fireplaces and wall-presses, and are well lighted.

The height of the Bedroom Floor is 9 feet.

The Section is cut on the line A—B through the parlor, court (shewing the elevation of the kitchen wing), and coal-house on the Ground Floor; and through the front bedroom on the Upper Floor.

FRONT ELEVATION

B

SCULLERY
12' × 8'

PANTRY

COALS

ASHES

PRIVY

LOBBY

COURT

KITCHEN
16·4' × 13·0'

PARLOR
12' × 13·6'

STAIRCASE

BEDROOM
12' × 11'

HALL

DRAWING ROOM
14' × 16·6'

DINING ROOM
14' × 16·6

VESTIBULE
8' × 7'

A

GROUND PLAN

10   5   0   10   20   30 FEET

END ELEVATION   B

ATTIC

ATTIC

ATTIC
13 · 6" × 9 · 6"

W.C.

ATTIC
12 × 9'· 6"

BEDROOM
16'· 6" × 11'· 6"

CLOSET

BEDROOM
16'· 6 × 11'· 6
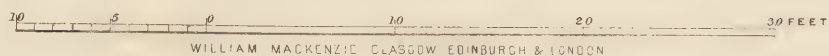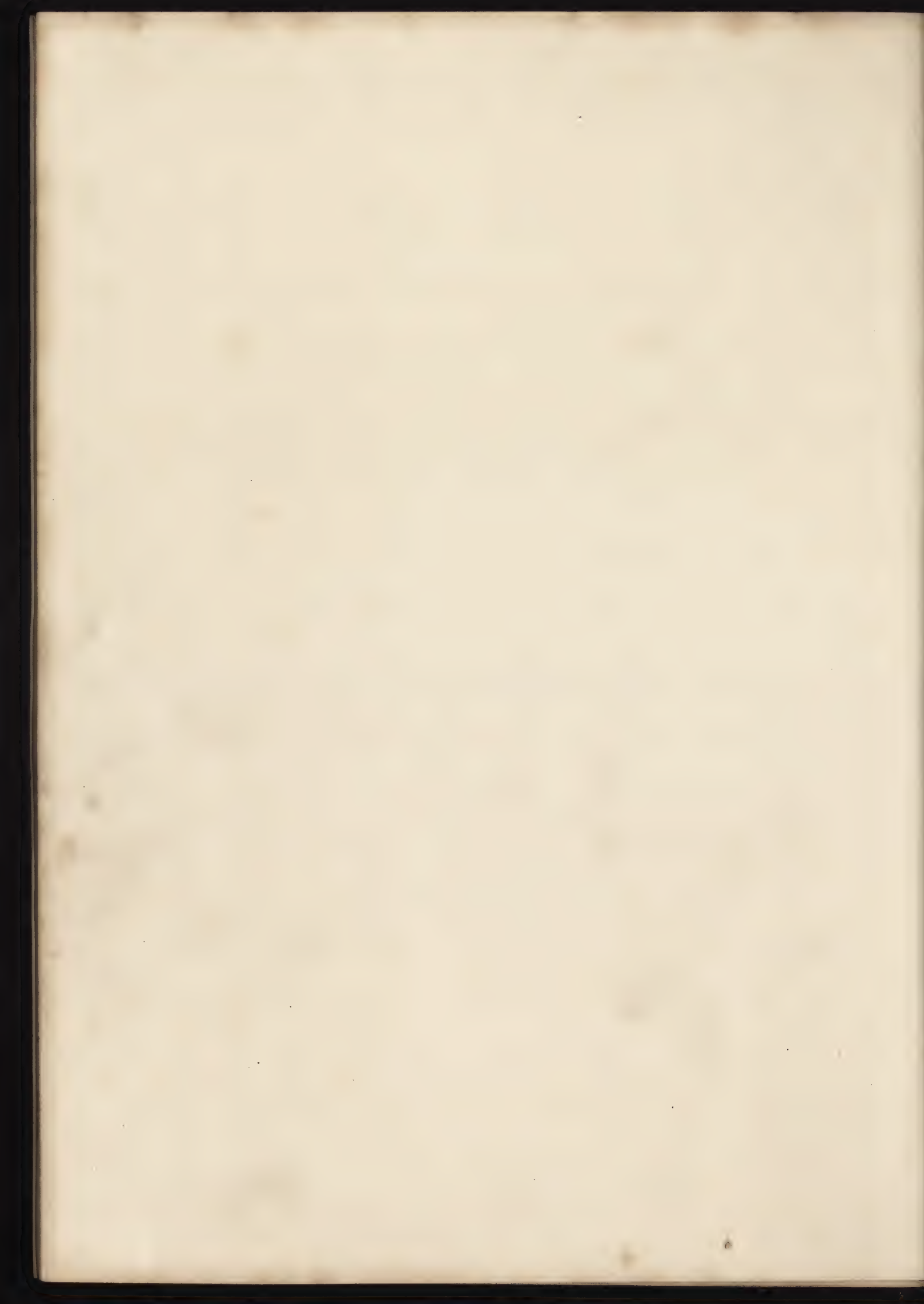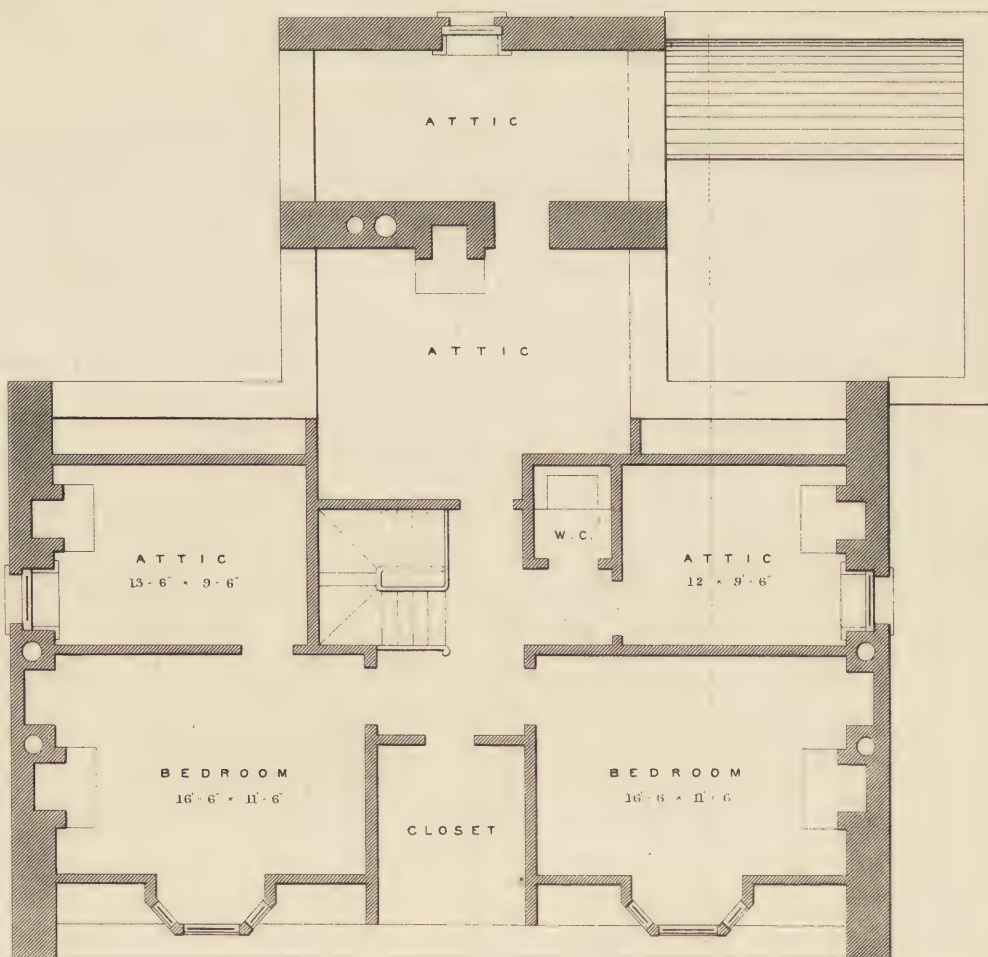
ATTIC PLAN   A
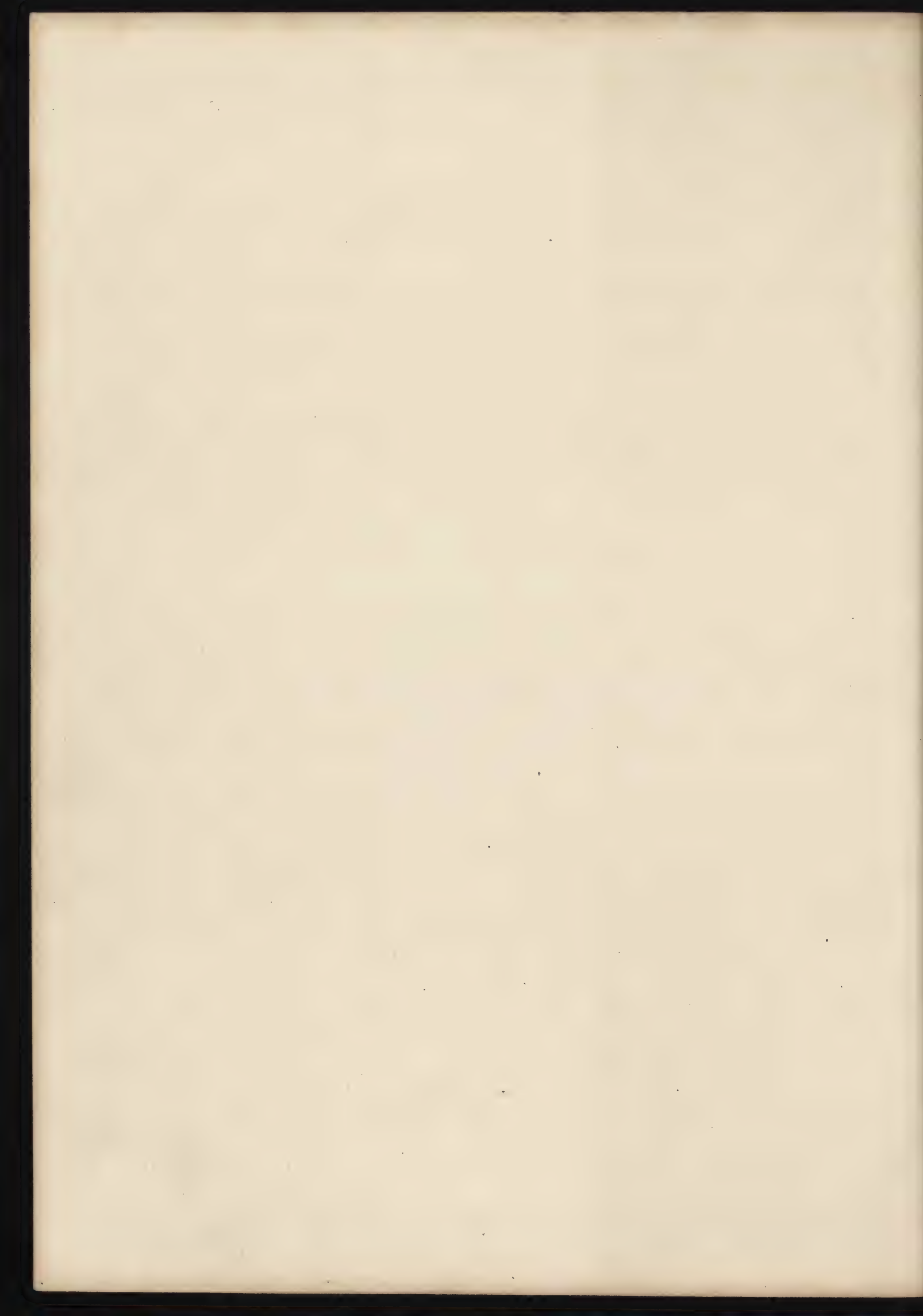
10   5   0   10   20   30 FEET
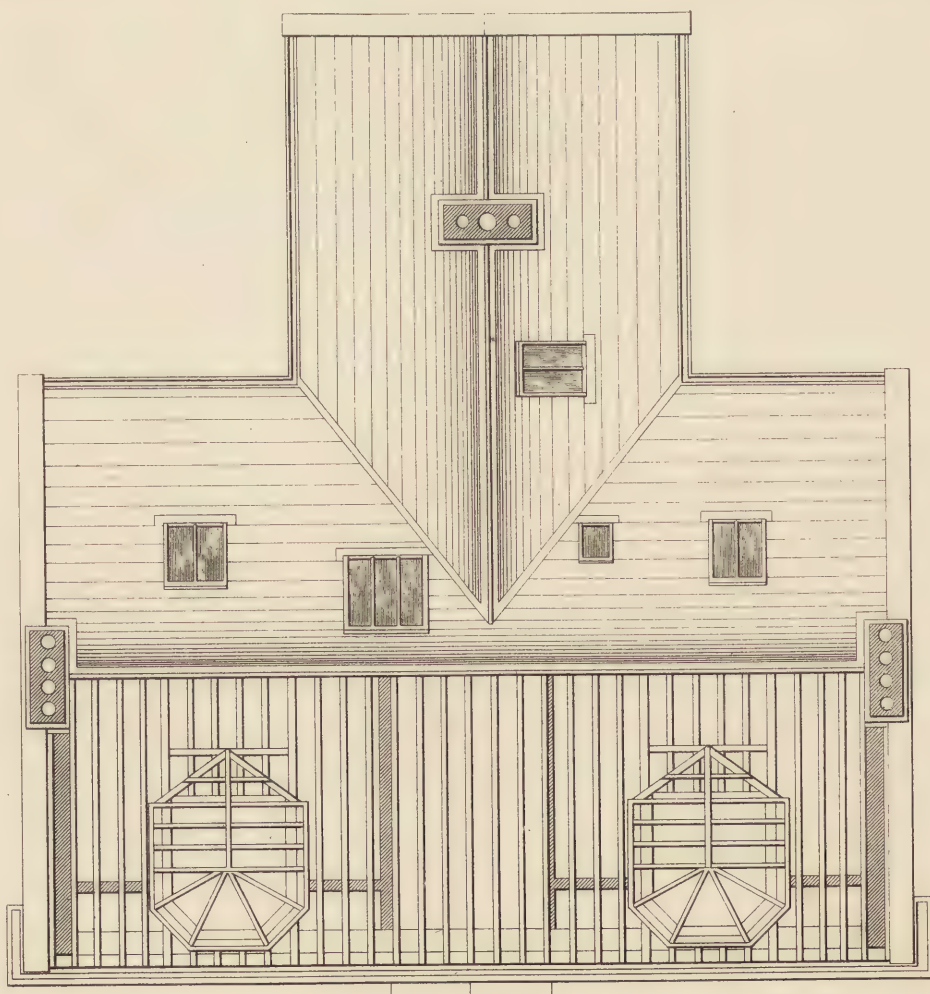
SECTION AT A.B.

PLAN OF ROOF

10 5 0 10 20 30 FEET
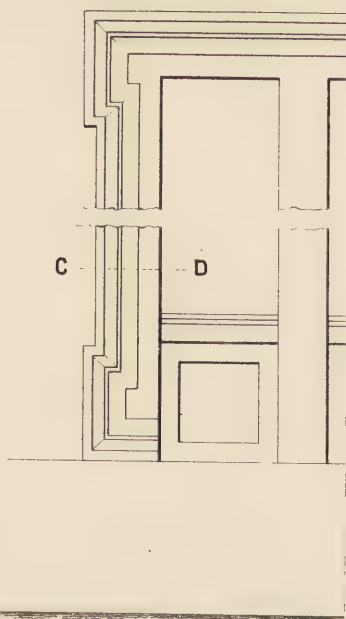
C   D   FRONT WINDOWS   CHIMNEYS
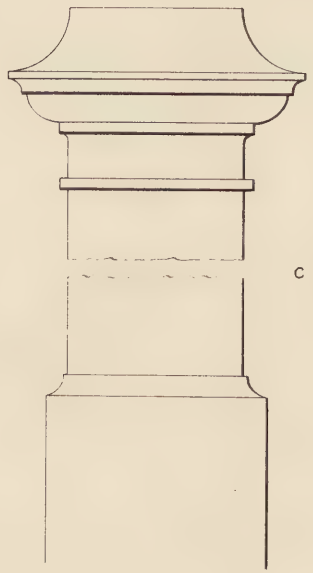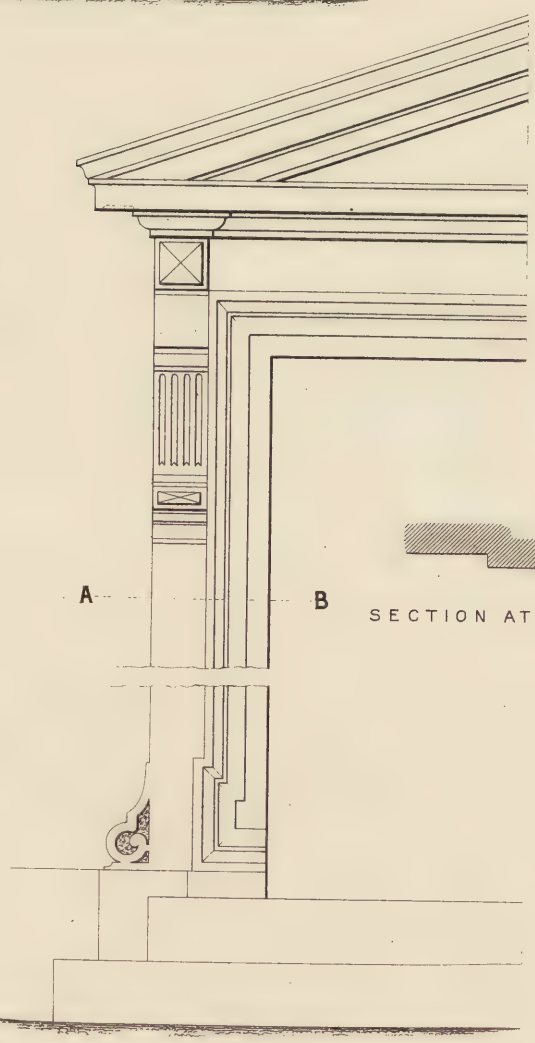
A   B   SECTION AT A.B. & C.D.   A   B
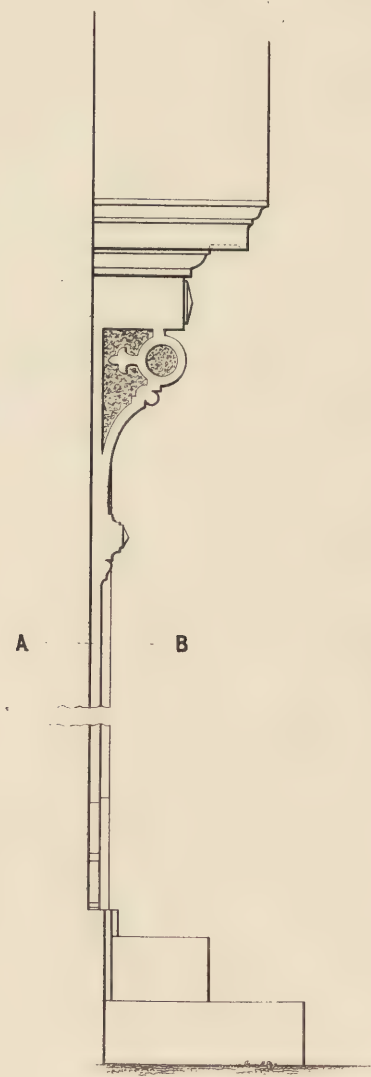
DETAILS of DOORWAY

SCALE ½ INCH TO THE FOOT.
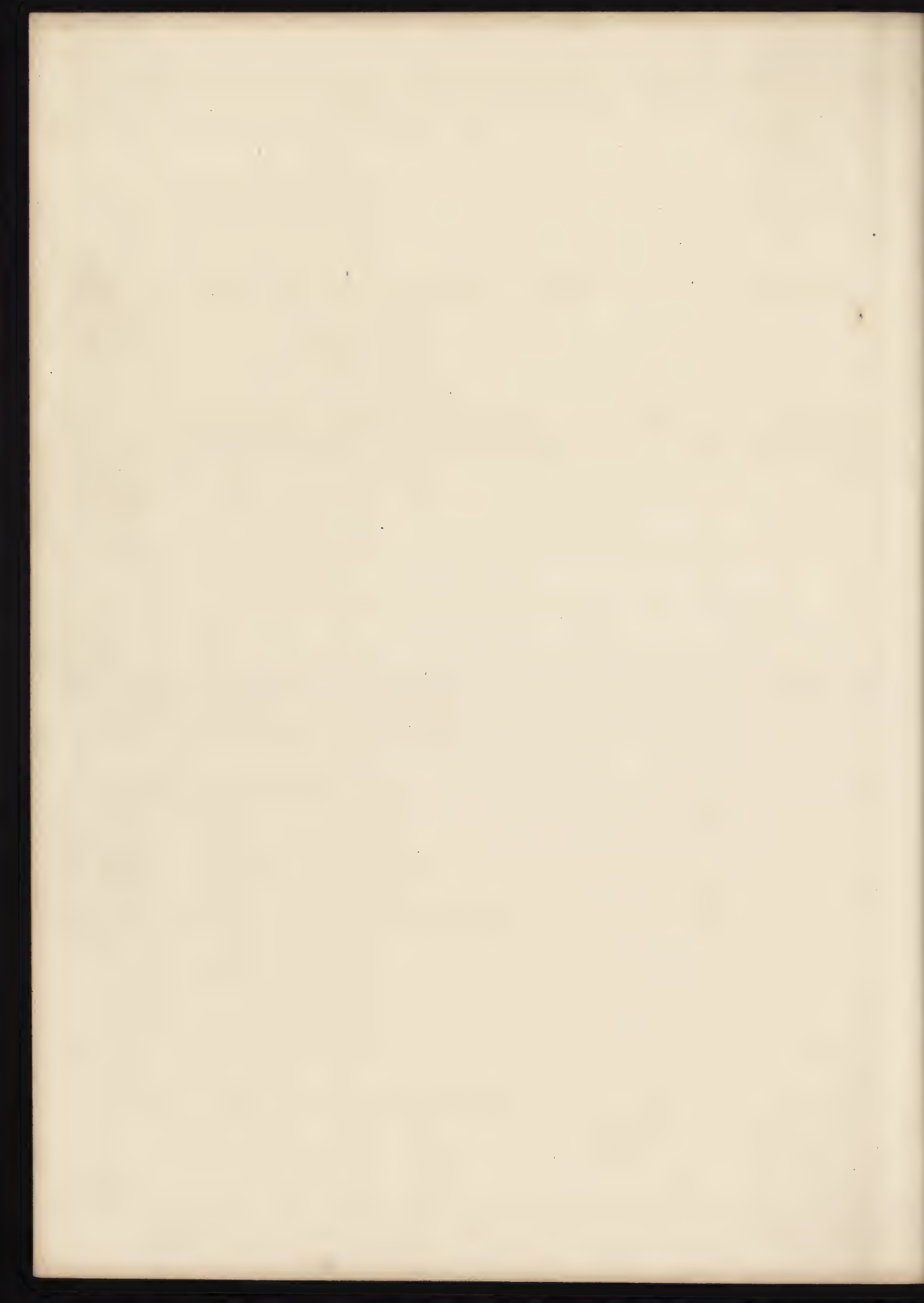
PLATES $\frac{J}{1}$ — $\frac{J}{4}$.

DESIGN FOR A COTTAGE IN THE ITALIAN STYLE.

PLATES $\frac{J}{1}$ — $\frac{J}{4}$ contain a design for a small and convenient Cottage, illustrated by a Ground Plan, Attic Plan, Front Elevation, End Elevation, Section, Roof Plan, and Details. The Cottage is designed in a very simple treatment of the Domestic Italian style; and is suitable for a country or suburban dwelling, containing all necessary conveniences. The drawings shew the walls to be built of stone; but brick may be used, with stone for the finishings of the doors and windows, the base-course, quoins, cornice, factables, chimney heads, &c. If cheapness is particularly desired, the walls may be built of rubble, and coated with rough-cast, the dressed stone finishings being retained.

PLATES $\frac{J}{1}$ — $\frac{J}{2}$.—GROUND PLAN.—On the Ground Floor there are three reception-rooms, viz., a dining-room and drawing-room, each measuring 16 feet 6 inches by 14 feet, and a parlour, measuring 13 feet 6 inches by 12 feet. There are also a small bed-room, measuring 12 feet by 11 feet, a kitchen, measuring 16 feet 4 inches by 13 feet, a scullery, and pantry.

The entrance door opens into a vestibule, 8 feet by 7 feet. The hall and staircase beyond are convenient, having all the principal apartments opening from them.

A coal-house, ash-pit, and privy are provided in the outbuilding in the court.

The height of the Ground Floor is 11 feet.

ATTIC PLAN.—On the Attic Floor there are six sleeping apartments, a water-closet, and lumber-closet. The two front rooms are good bedrooms, being well lighted by dormer windows, and supplied with fireplaces and wardrobe presses. The two small rooms adjoining are lighted by windows in the gables, and have small fireplaces. The servants' attics are lighted by a gable window and skylight as shewn.

The height of the Attic Floor is 9 feet 6 inches.

PLATES $\frac{J}{3}$ — $\frac{J}{4}$ contain the Section, Roof Plan, and Details. The Section is cut on the

DESIGN FOR A COTTAGE IN THE ITALIAN STYLE.

line A—B through the dining-room and small bedroom on the Ground Floor, and the respective bedrooms over. It also cuts the outbuilding in the court, and shews the court side of the kitchen wing.

Portion of the Roof Plan is shewn slated, and portion in the naked timbers.

The Details shew the entrance doorway, front windows, and chimney heads, drawn to a scale of $\frac{1}{2}$ inch to the foot.

FRONT ELEVATION

ASHES

W.C.

COALS

B

SCULLERY
12' × 5'

PARLOR
16' × 12'

BEDROOM
10'·0" × 9·4"

STAIR

LIVING ROOM
12'·0" × 10'·6"

A

GROUND PLAN

10   5   0   10   20   30   40   50 FEET

SECTION at A.B.

BEDROOM PLAN

CLOSET

BEDROOM
16' · 12'

LANDING

BEDROOM
16' · 12'

STAIR
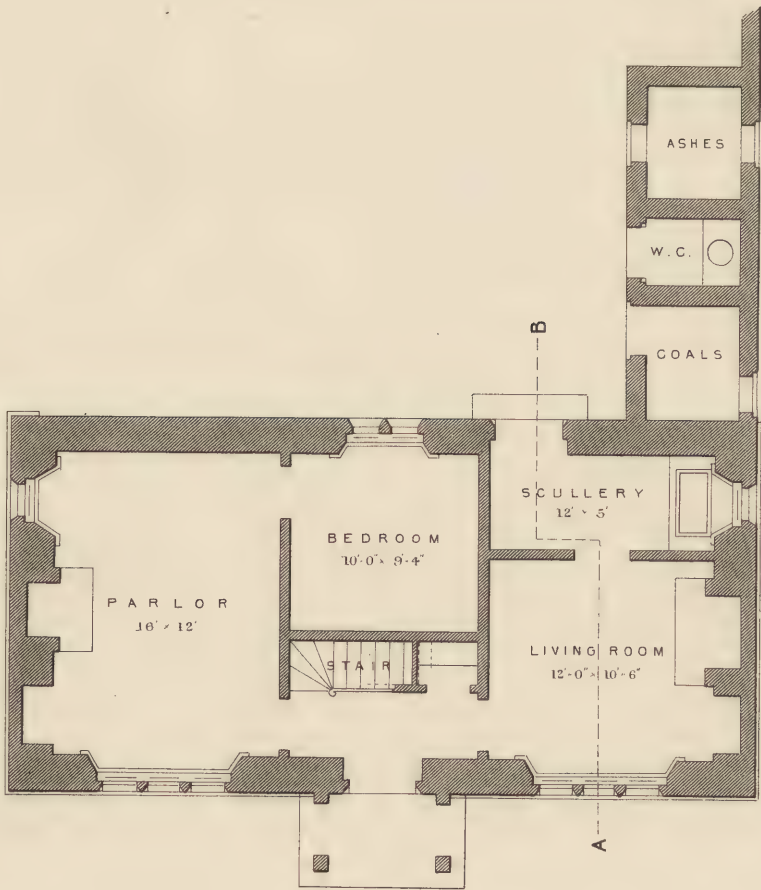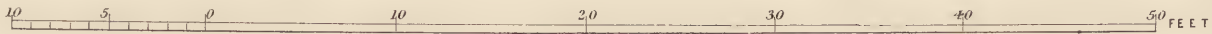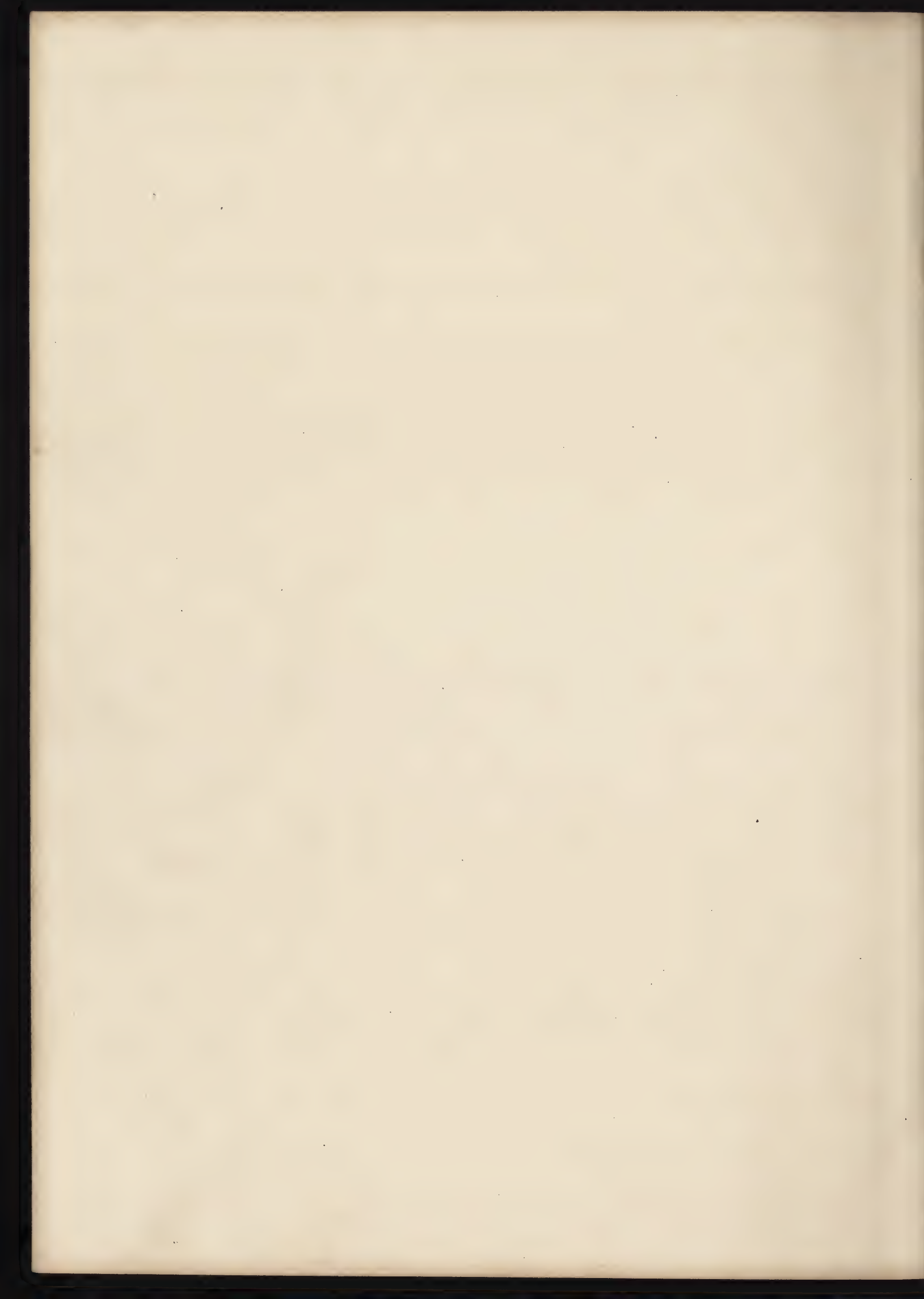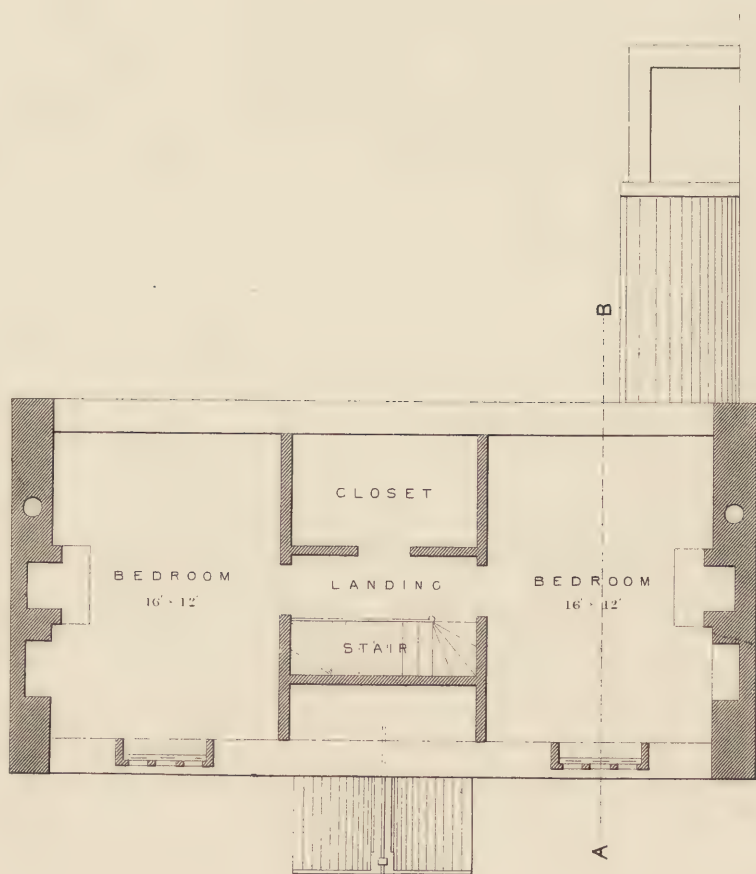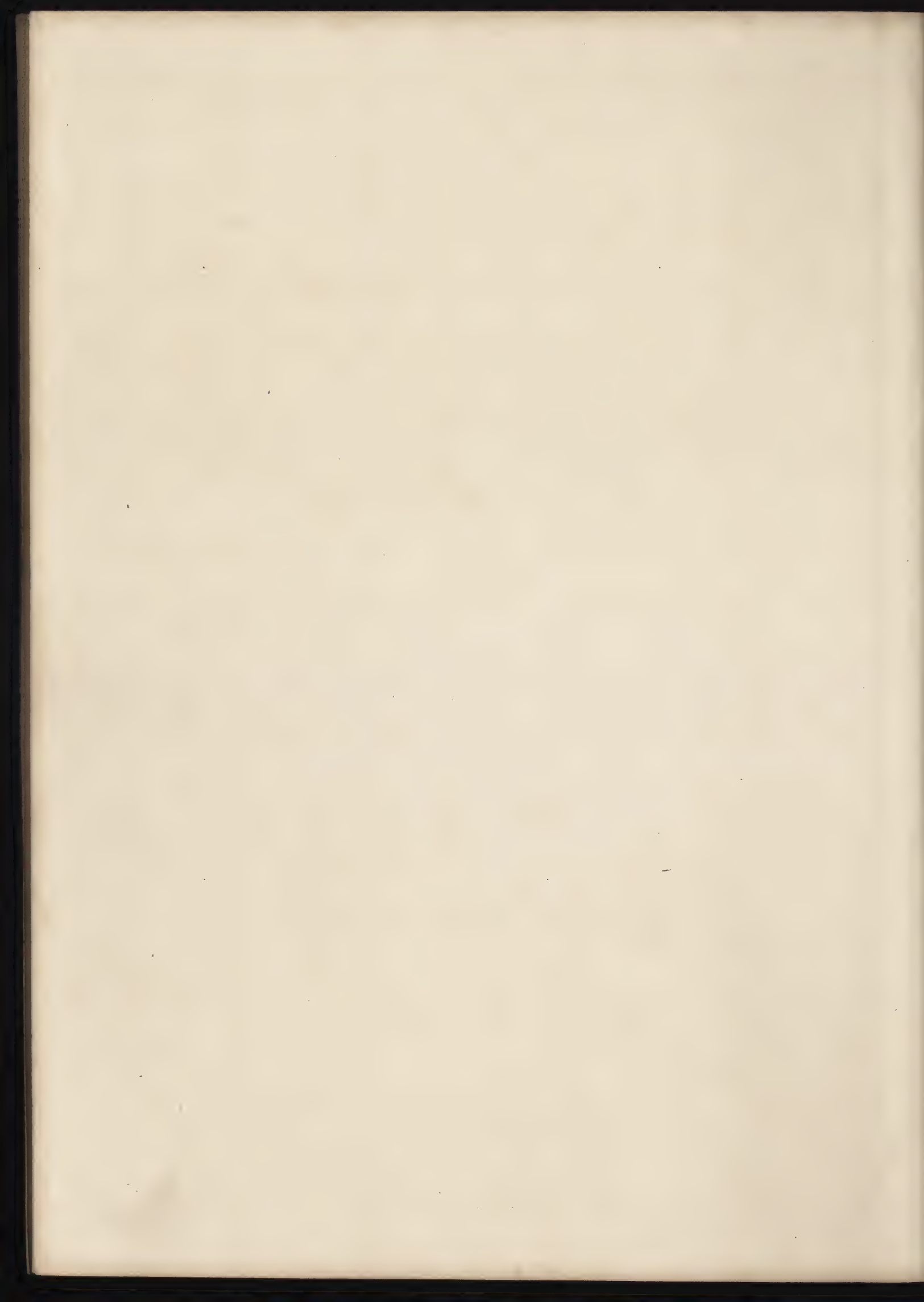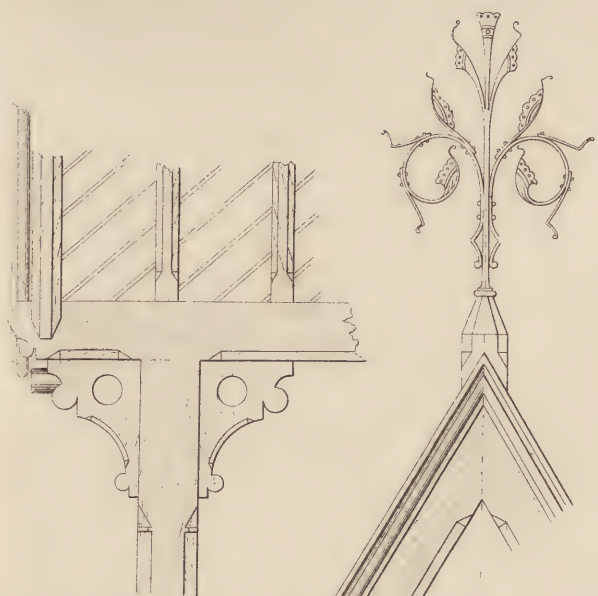
BRACKETS &c. AT A

FRONT WINDOWS

A
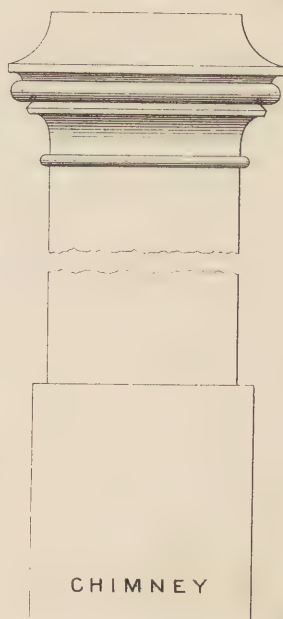
CHIMNEY
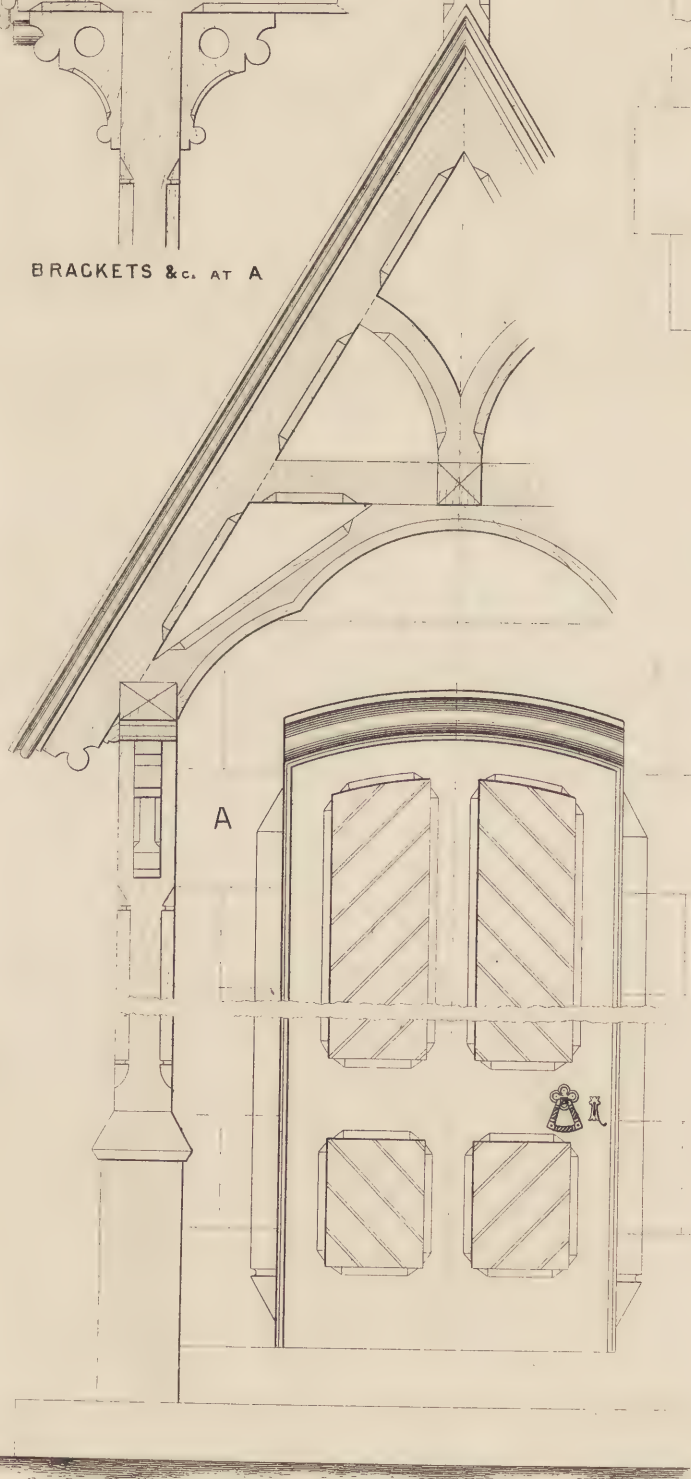
ENTRANCE PORCH

DORMER WINDOW

12 6 0 1 2 3 4 5 6 7 FEET
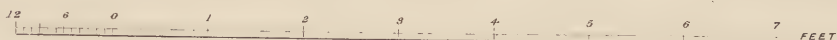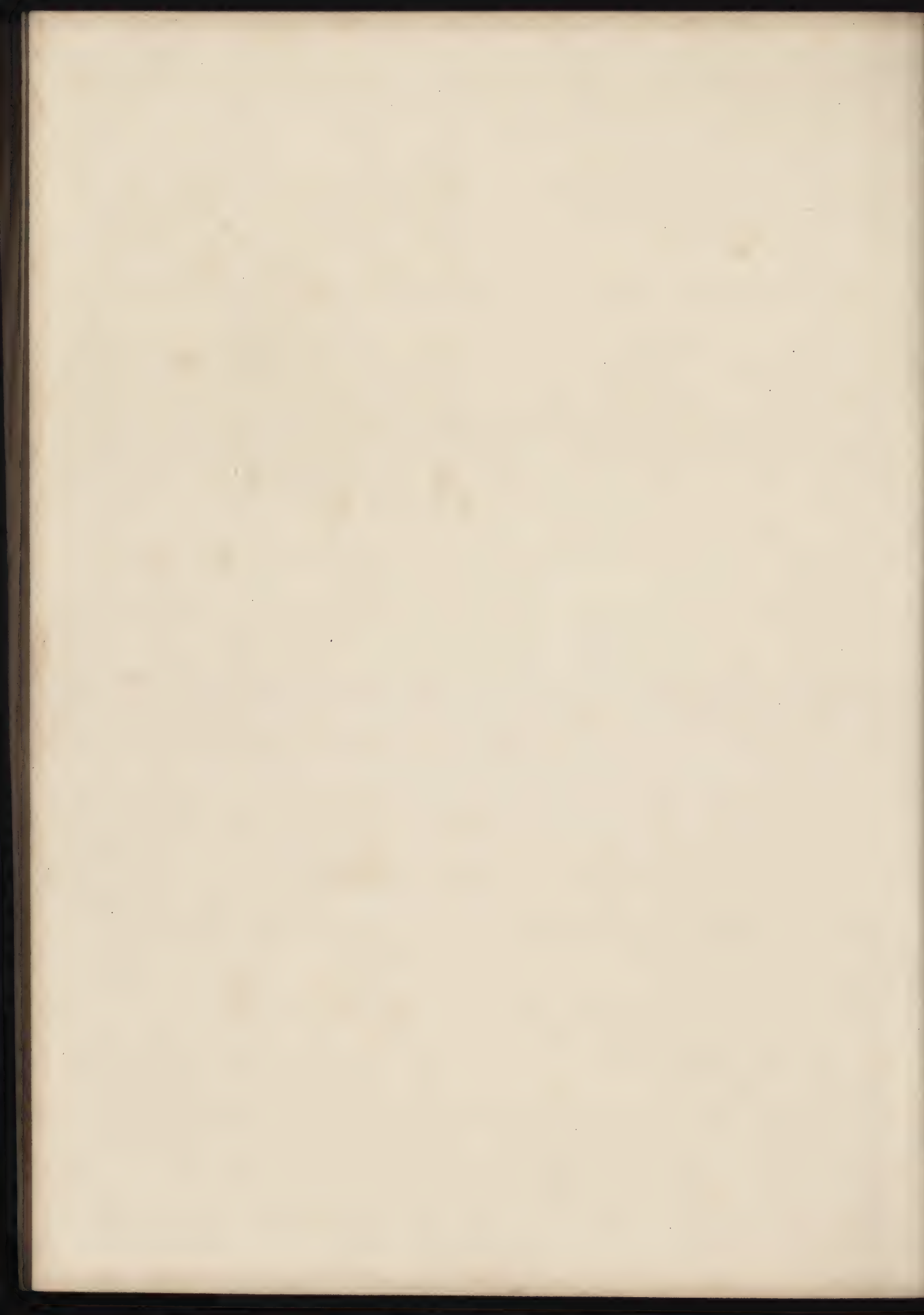
PLATES $\frac{K}{1}$ — $\frac{K}{2}$.

BAILIFF'S COTTAGE.

PLATES $\frac{K}{1}$ — $\frac{K}{2}$ contain Ground Plan, Attic Plan, Elevation, and Section of a small cottage, suitable for the residence of a Farm Bailiff, or Forester on an estate.

The Design is of a simple character, the stone-work being quite plain throughout. A slight degree of ornament is given to the Elevation by the introduction of open timber work in the porch and dormer windows. The gables may be finished in like manner, or by plain chamfered barge boards. The porch and dormer windows are finished with wrought-iron finials.

GROUND PLAN—The Ground Floor contains a parlor 16 feet by 12 feet with a bedroom off, measuring 10 feet by 9 feet 4 inches; a general living room 12 feet by 10 feet 6 inches; and a scullery 12 feet by 5 feet, fitted with a sink complete.

The stair to the Attics starts from the lobby near the parlor door. Underneath the stair is a small pantry.

An ash-pit, coal-house, and privy are provided in outbuildings.

PLATE $\frac{K}{2}$.—ATTIC PLAN.—On the Bedroom Floor there are two good bedrooms, measuring 16 feet by 12 feet; and a small closet opening off the landing. The landing and closet are lighted by a skylight.

SECTION.—The Section drawn on the line A—B cuts the living room and scullery on the Ground Floor, and one of the bedrooms over. It shews the side of the porch and section of dormer window.
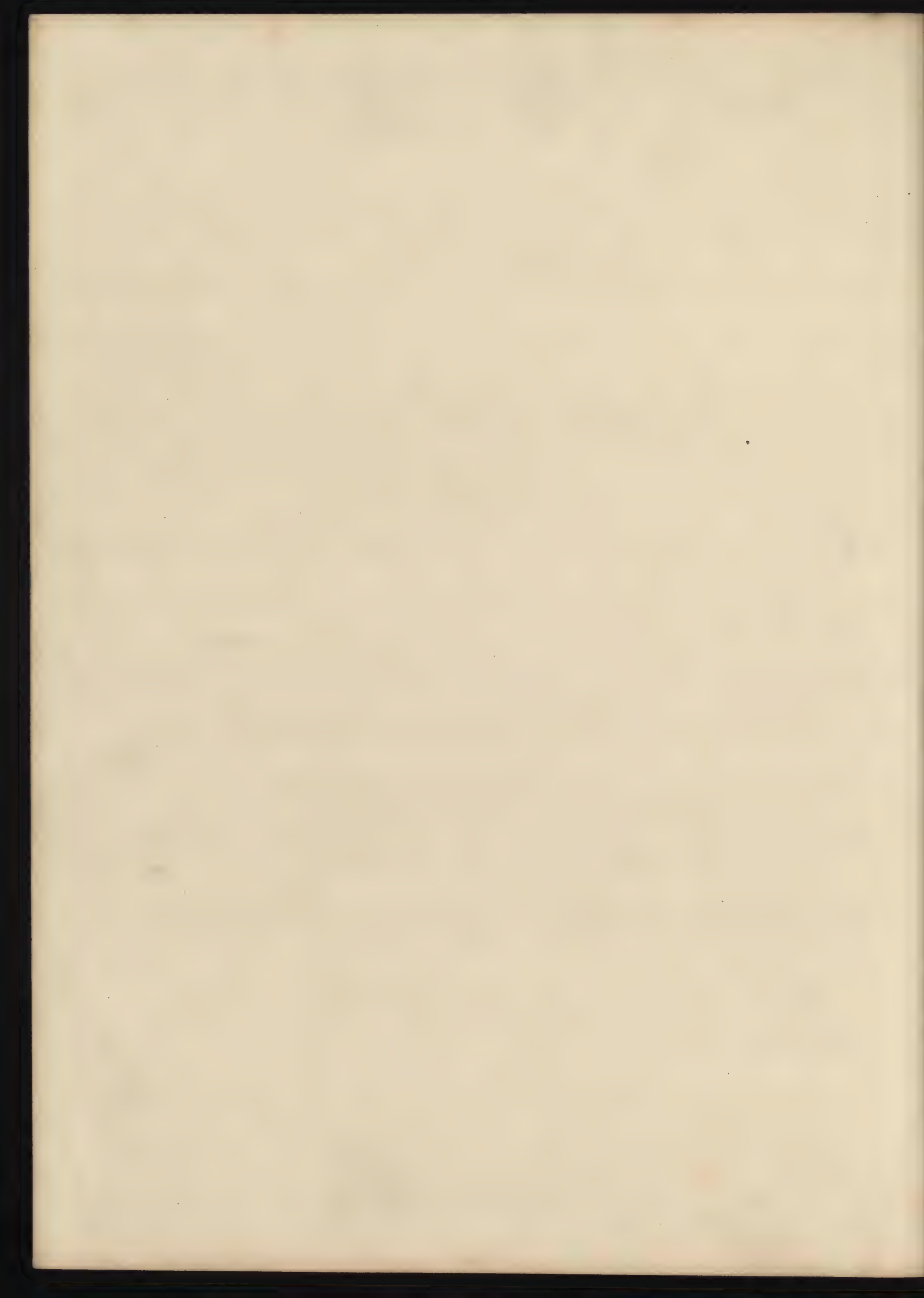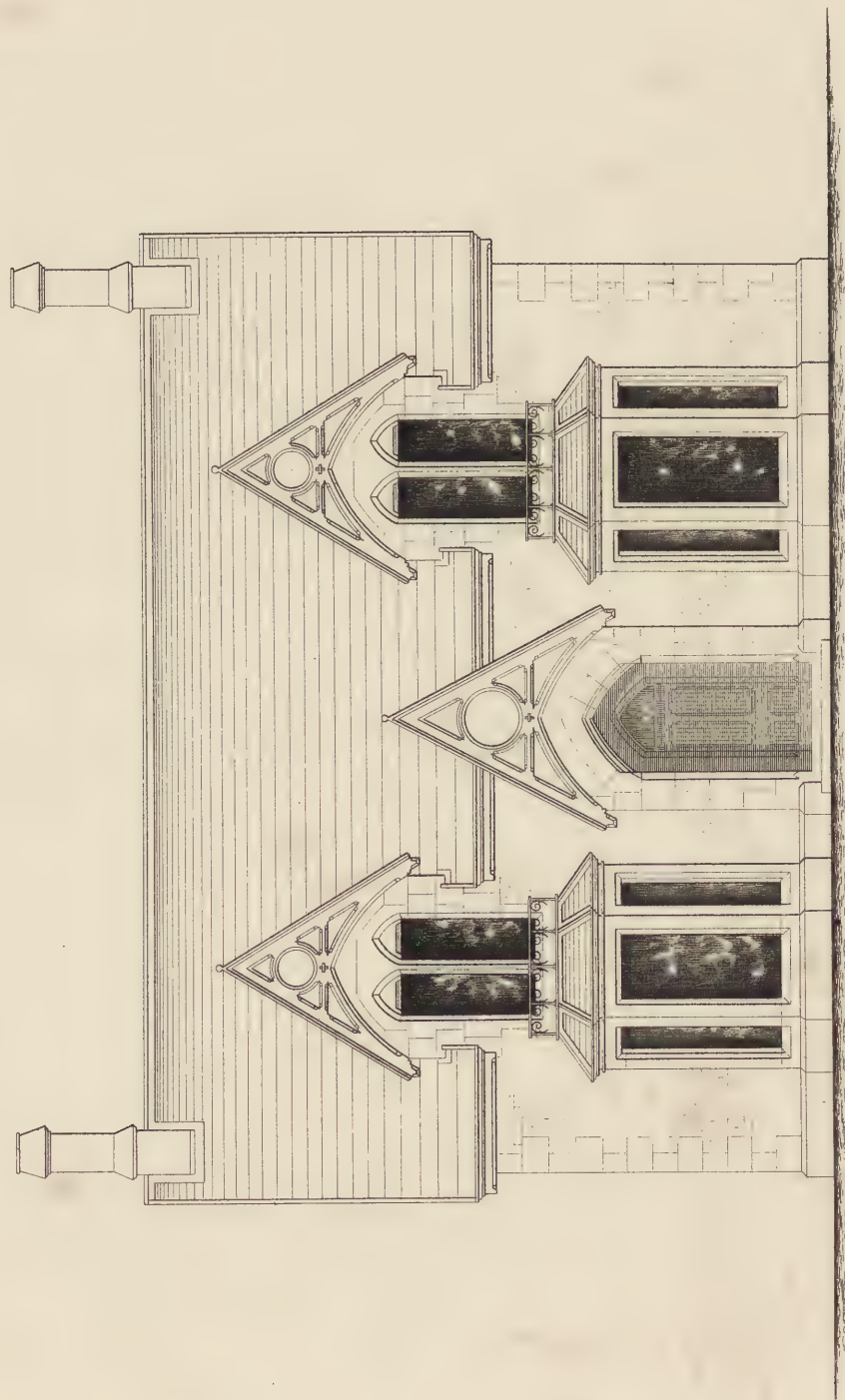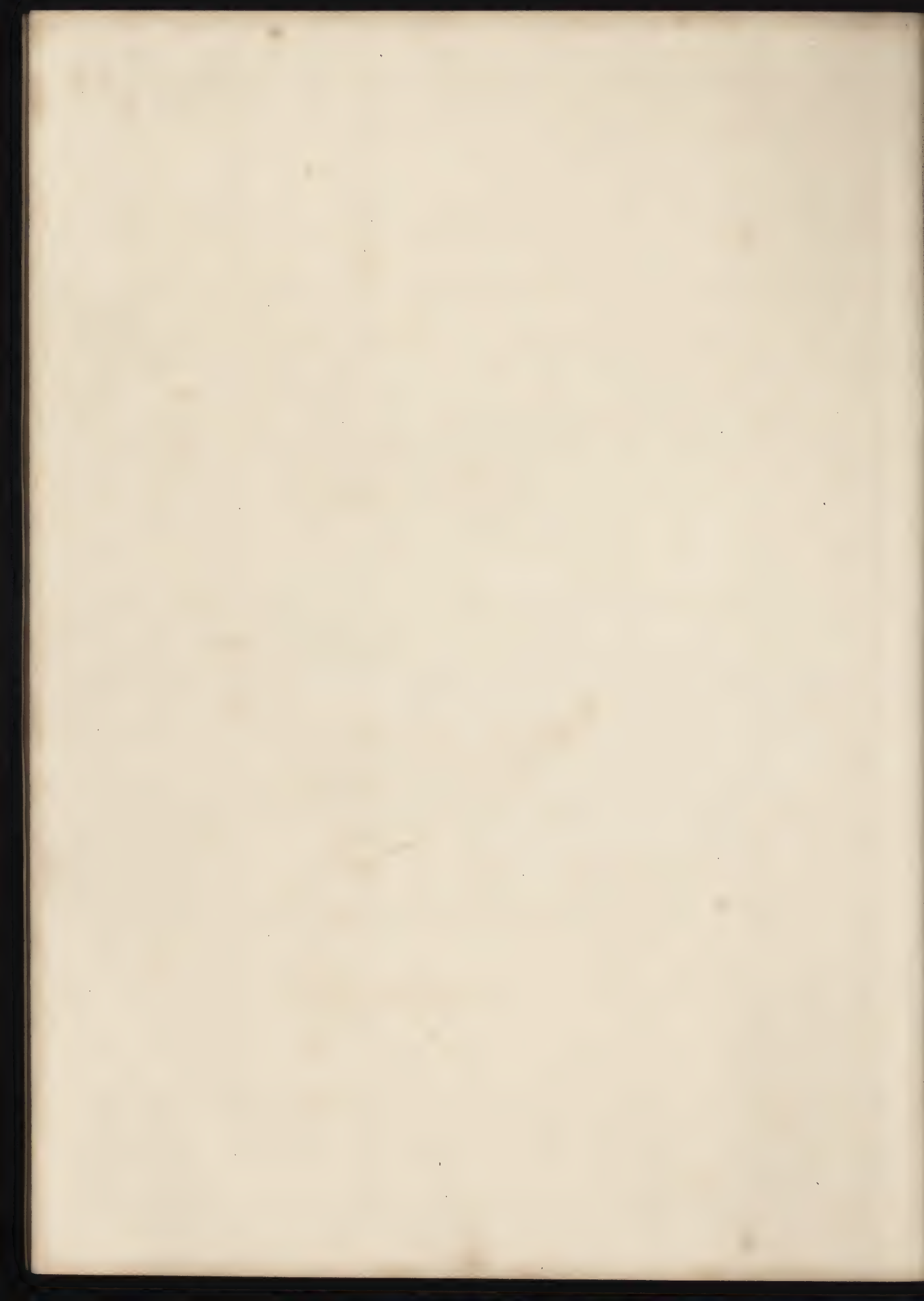
COTTAGE

FRONT ELEVATION

COTTAGE

SECTION AT A.B.

10   5   0   10   20   30   40   50 FEET

B

KITCHEN
16'-6" × 14'-0"

SINK

ASH PIT

SCULLERY
11' × 10'

PRIVY

PANTRY LOBBY

COURT

PARLOUR
17' × 12'

STAIRCASE

BEDROOM
17' × 12'

DRAWING ROOM
17' × 14'

DINING ROOM
17' × 14'

PORCH

A

GROUND PLAN

10   5   0   10   20   30   40 FEET

B

BEDROOM
16'·6" × 14'·0"

SERVTS BEDROOM
11' × 10'

BATH & W.C.

BEDROOM
17' × 12'

LANDING

BEDROOM
17' × 12'

BEDROOM
17' × 14'

CLOSET

BEDROOM
17' × 14'

A

BEDROOM PLAN

10   5   0   10   20   30   40 FEET

PLAN of ROOF

10   5   0   10   20   30 FEET
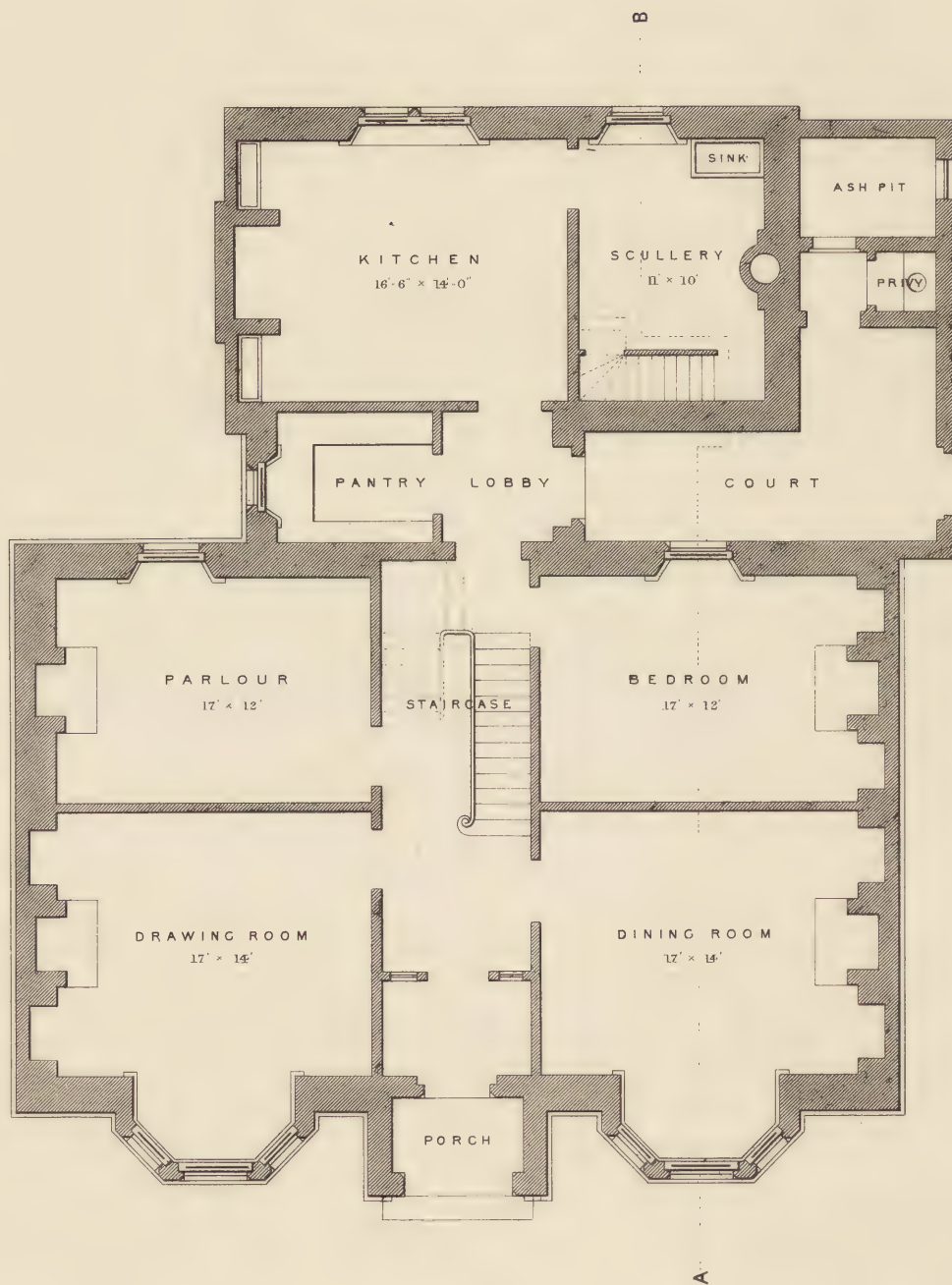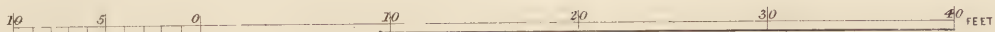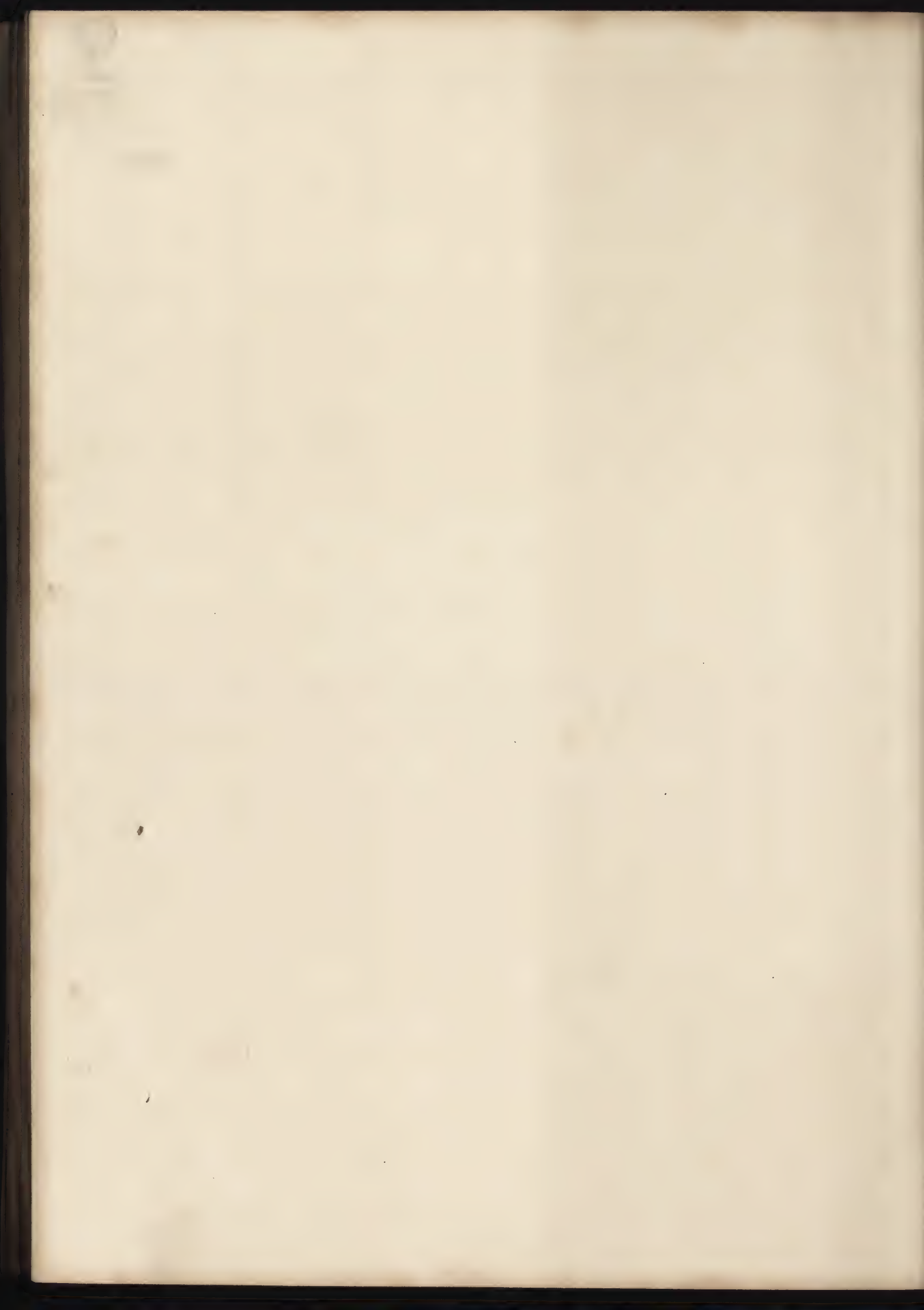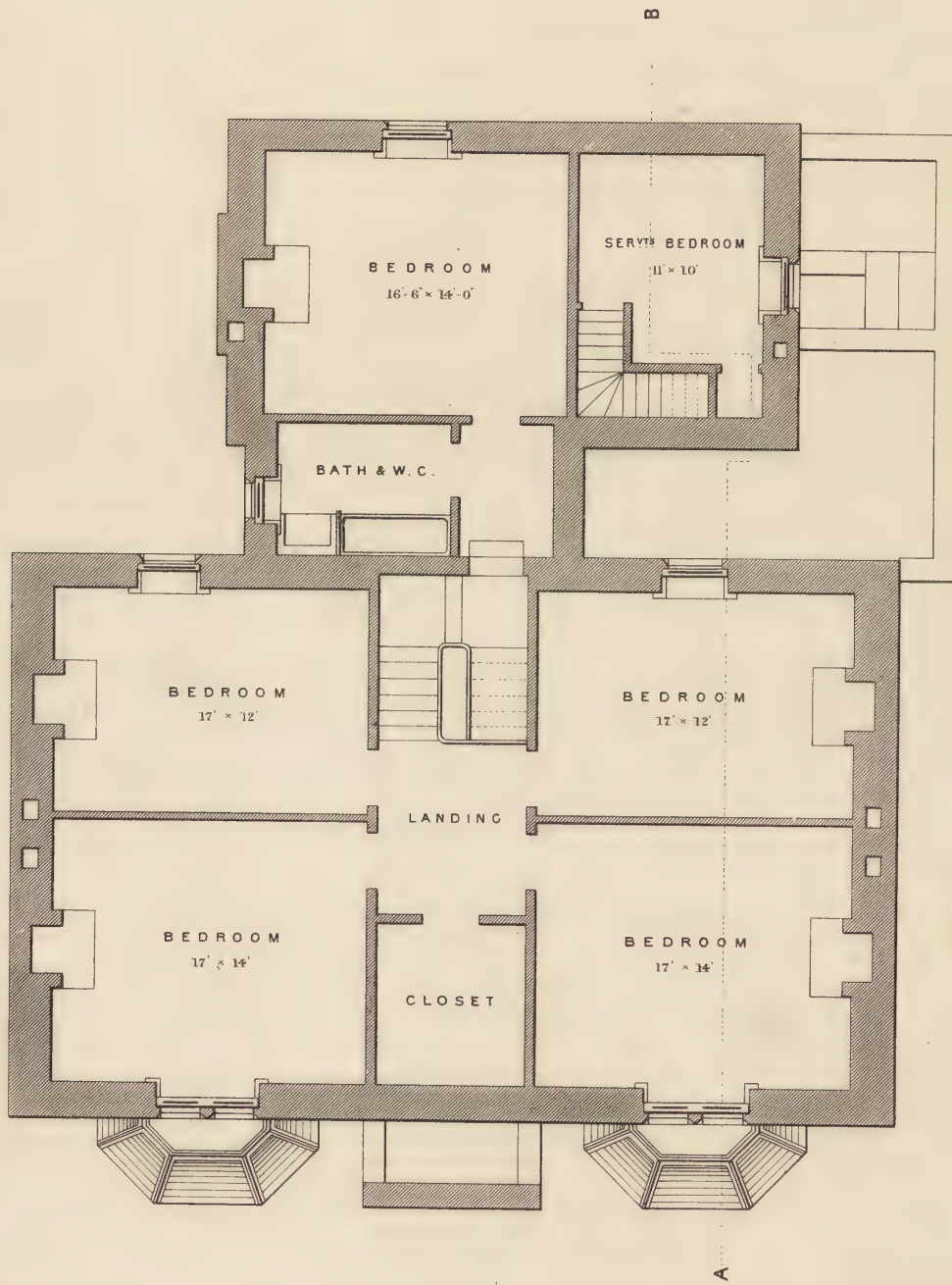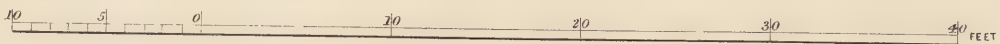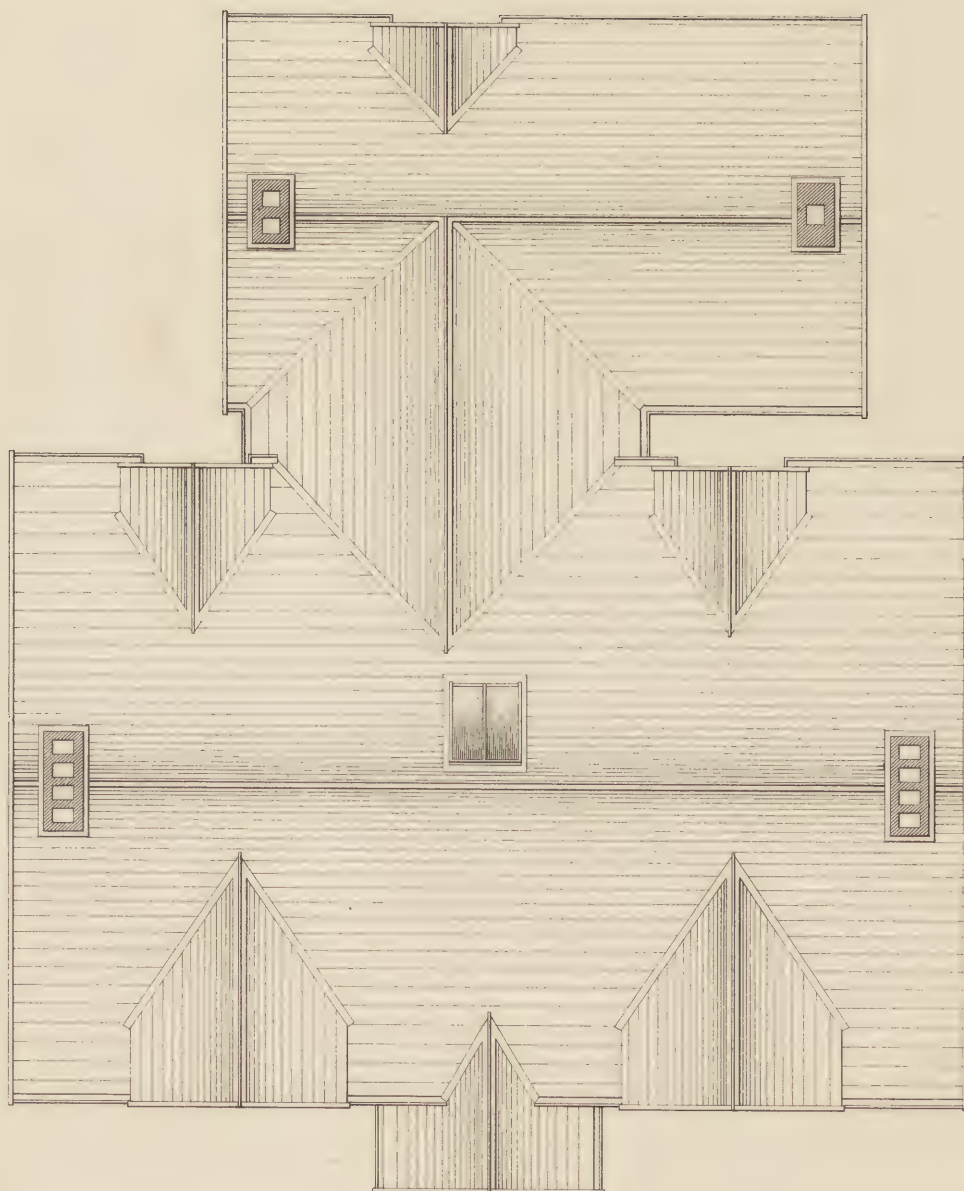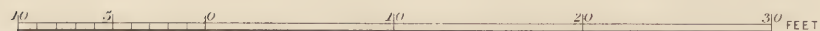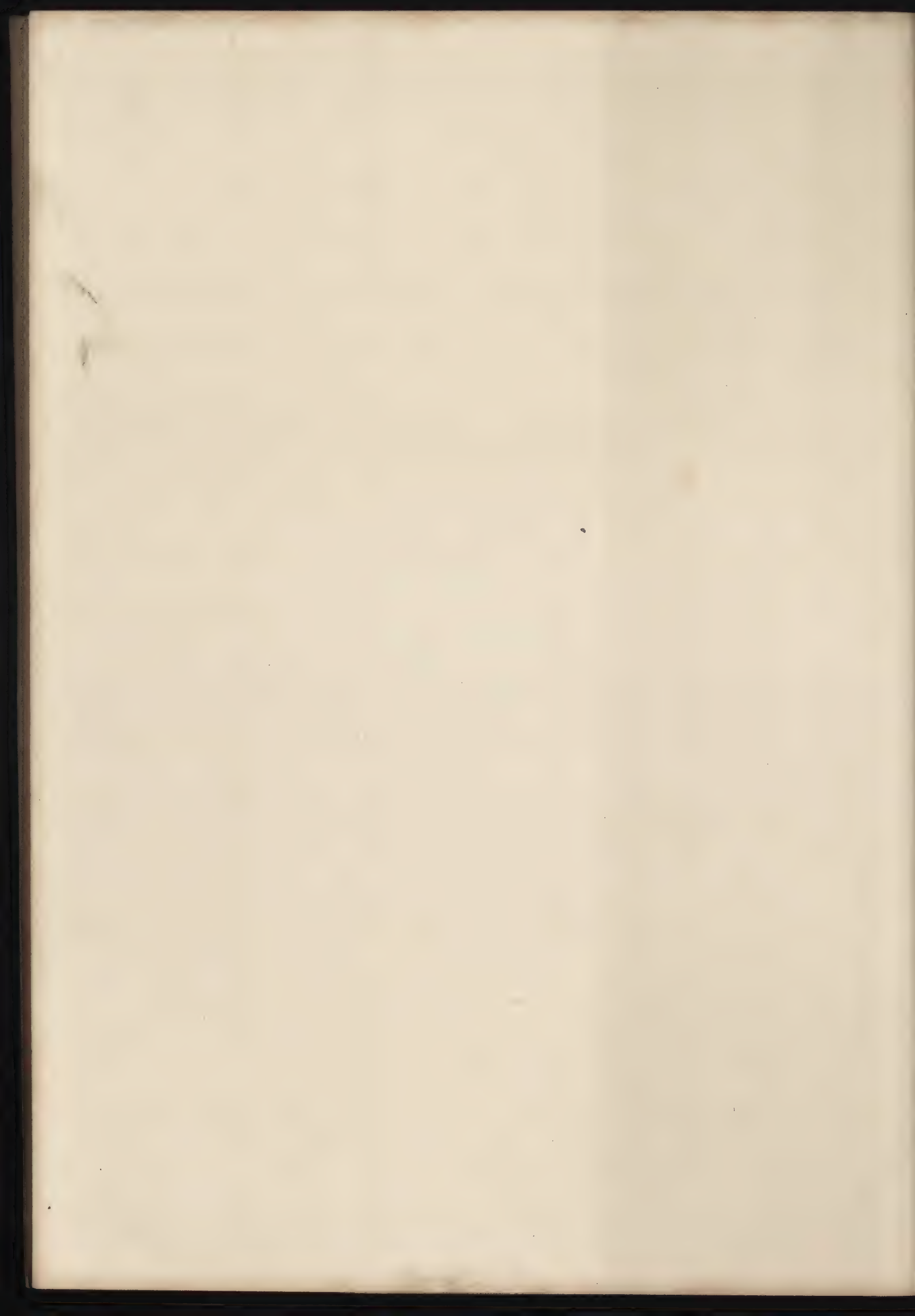
DORMER WINDOWS
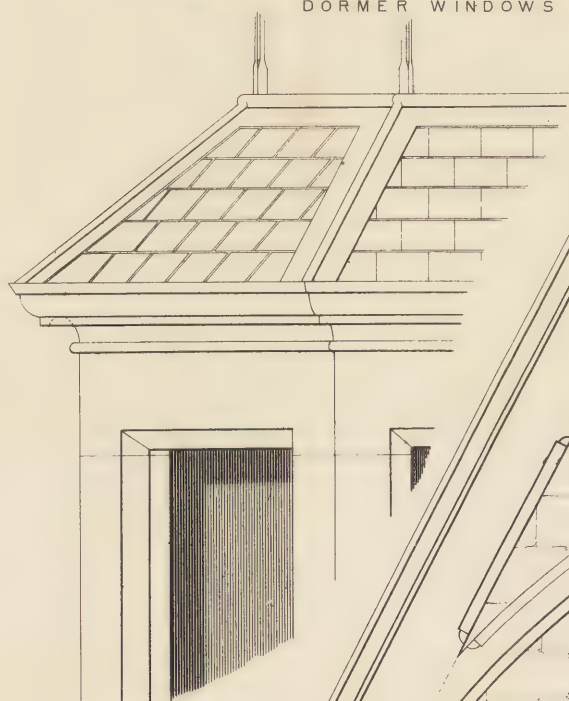
BOW WINDOWS
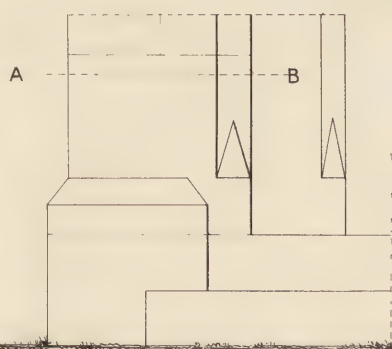
CHIMNEY

SECTION AT C.D.

PLAN AT A.B.

A —————— B

C

D

DETAILS OF PORCH
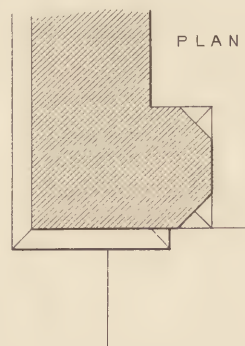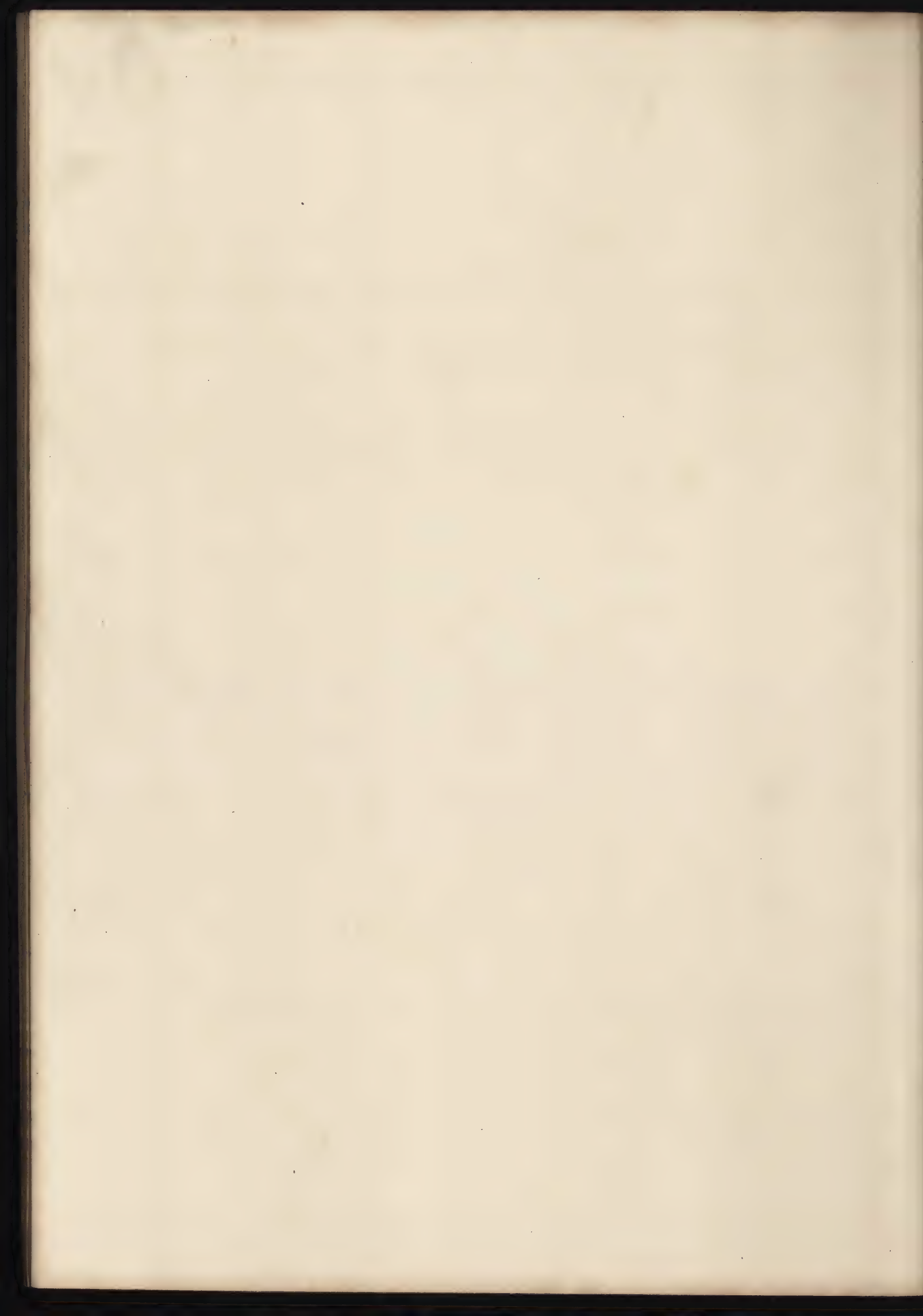
PLATES $\frac{L}{1}$ — $\frac{L}{6}$.

DESIGN FOR A COTTAGE.

PLATES $\frac{L}{1}$ — $\frac{L}{6}$ shew Ground Plan, Bedroom Plan, Front Elevation, Section, Roof Plan, and Details of a small and convenient cottage, suitable for a country or suburban residence. Internally it contains all the accommodation and conveniences necessary for a comfortable dwelling; and externally it is of sufficient architectural importance to render it attractive, while its design may be carried out at a trifling cost. It is shewn to be built of stone, but brick may be used for the general walls, stone being retained in the base-course, quoins, chimneys, and the finish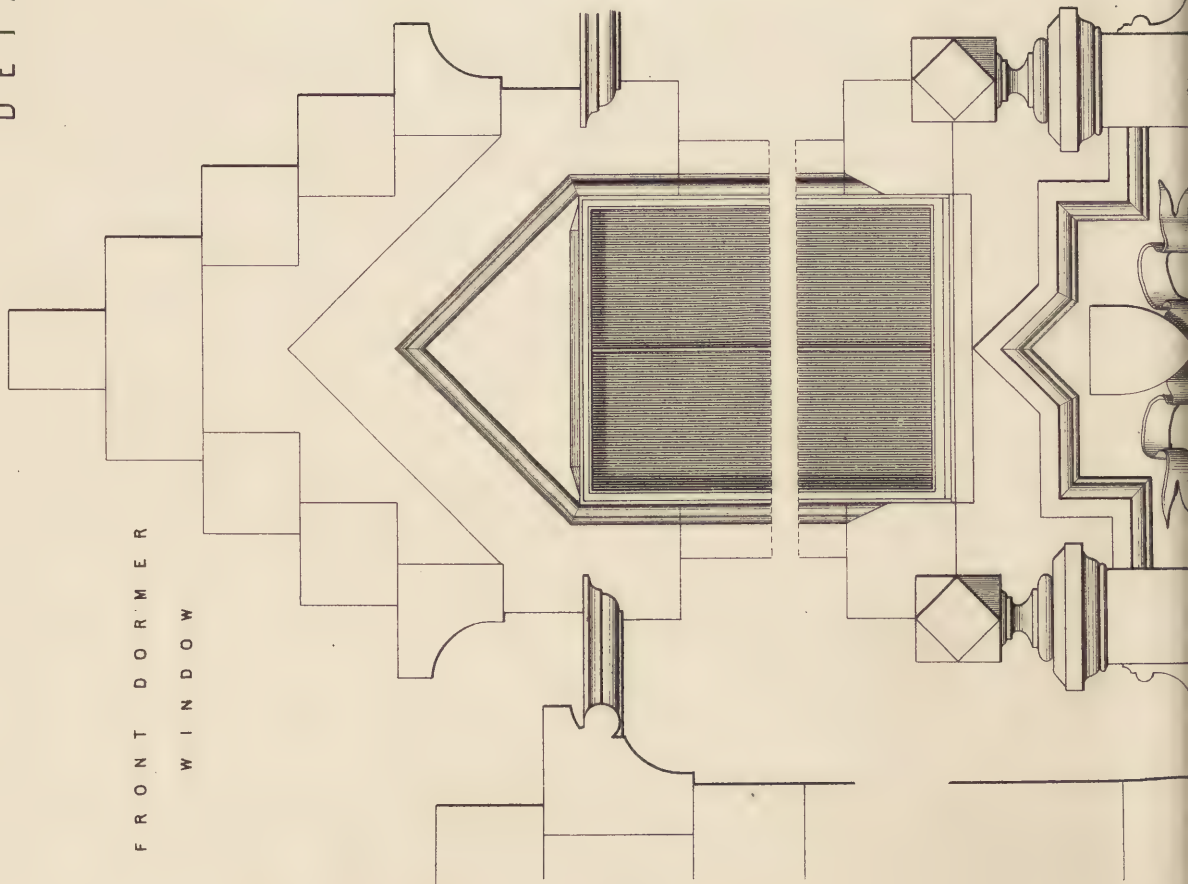ings of the doors, windows, and entrance porch. If a simpler design is desired, the ornamental woodwork of the porch and front dormer windows may be dispensed with, and plain barge-boards substituted.

PLATES $\frac{L}{3}$ — $\frac{L}{4}$.—GROUND PLAN.—On the Ground Floor there are three public rooms, a bedroom, kitchen, scullery, pantry, and outbuildings. To these are added an open entrance porch, small vestibule, and hall and staircase. The dining and drawing rooms, which are of the same size, measure 17 feet long by 14 feet wide, exclusive of their bay windows which are 8 feet 6 inches by 5 feet inside. Each of these rooms has two cupboards in the firewall.

The back parlor or morning room measures 17 feet by 12 feet. The bedroom is of the same size.

The kitchen, situated in the back wing, is 16 feet 6 inches by 14 feet. It is fitted with two convenient cupboards.

The scullery, opening off the kitchen, measures 11 feet by 10 feet, and is fitted with a small boiler and sink. The stair to the servants' bedroom starts here.

The ash-pit and privy are in the outbuildings.

DESIGN FOR A COTTAGE.

The height of the Ground Floor in the main part of the cottage is 11 feet, in the kitchen wing 9 feet 6 inches.

BEDROOM PLAN.—On the Bedroom Floor there are five good bedrooms (exclusive of the servants' over the scullery), a bathroom and water-closet, and a small lumber closet.

The two front bedrooms are 17 feet long by 14 feet wide; the two back are 17 feet by 12 feet; and that over the kitchen is 16 feet 6 inches by 14 feet.

The height of the four main bedrooms is 11 feet; the height of the one in back wing is 9 feet.

PLATES $\frac{L}{1}$ — $\frac{L}{2}$ shew the Front Elevation, and the Section cut on the line A—B. The Section shews the dining room, bedroom, kitchen door from court, and the scullery on the Ground Floor, and the respective bedrooms over.

PLATES $\frac{L}{5}$ — $\frac{L}{6}$ contain the Plan of the Roof, and the Details of the ornamental features. The Details are drawn to the scale of half inch to one foot.
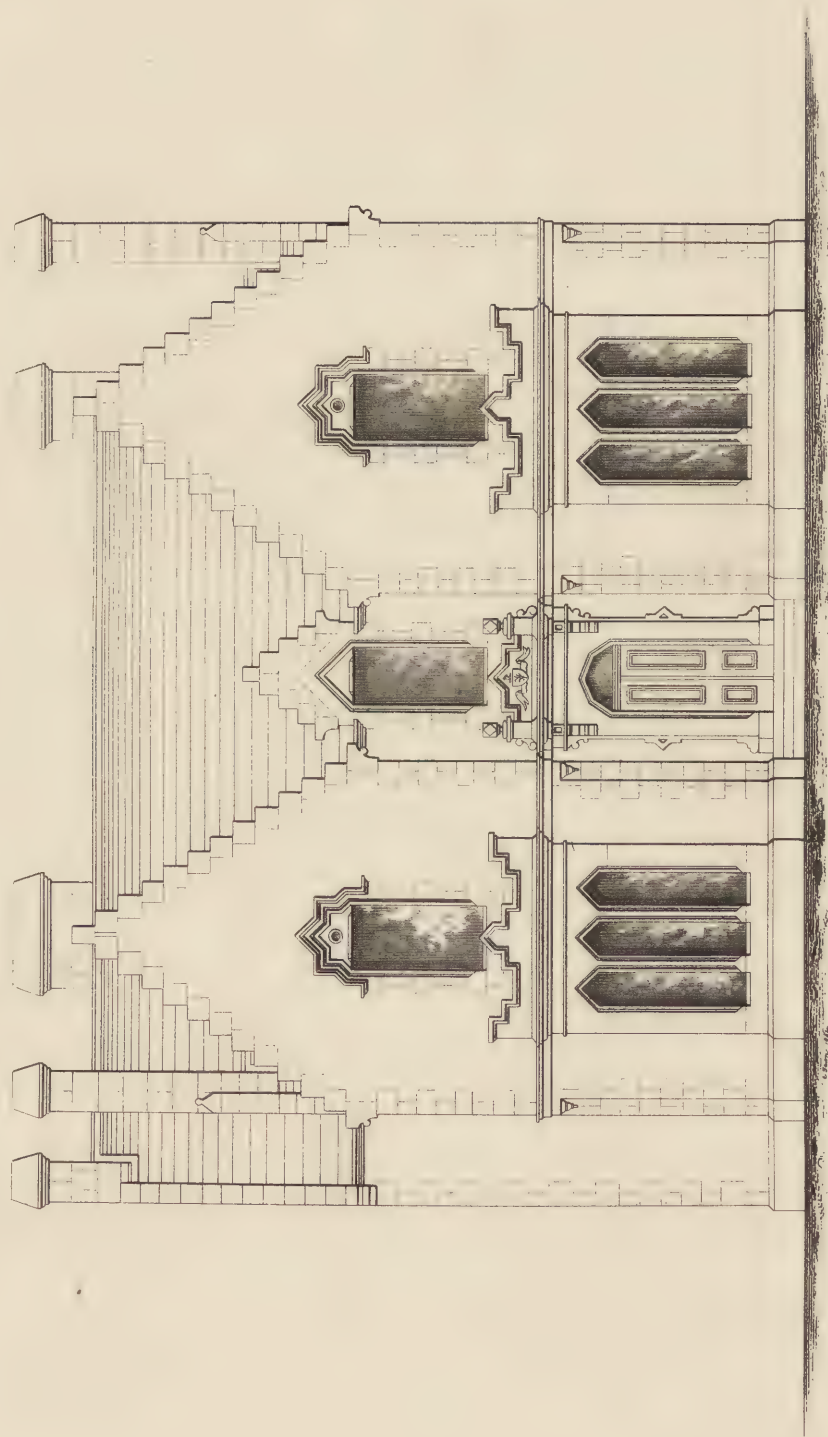
FRONT ELEVATION
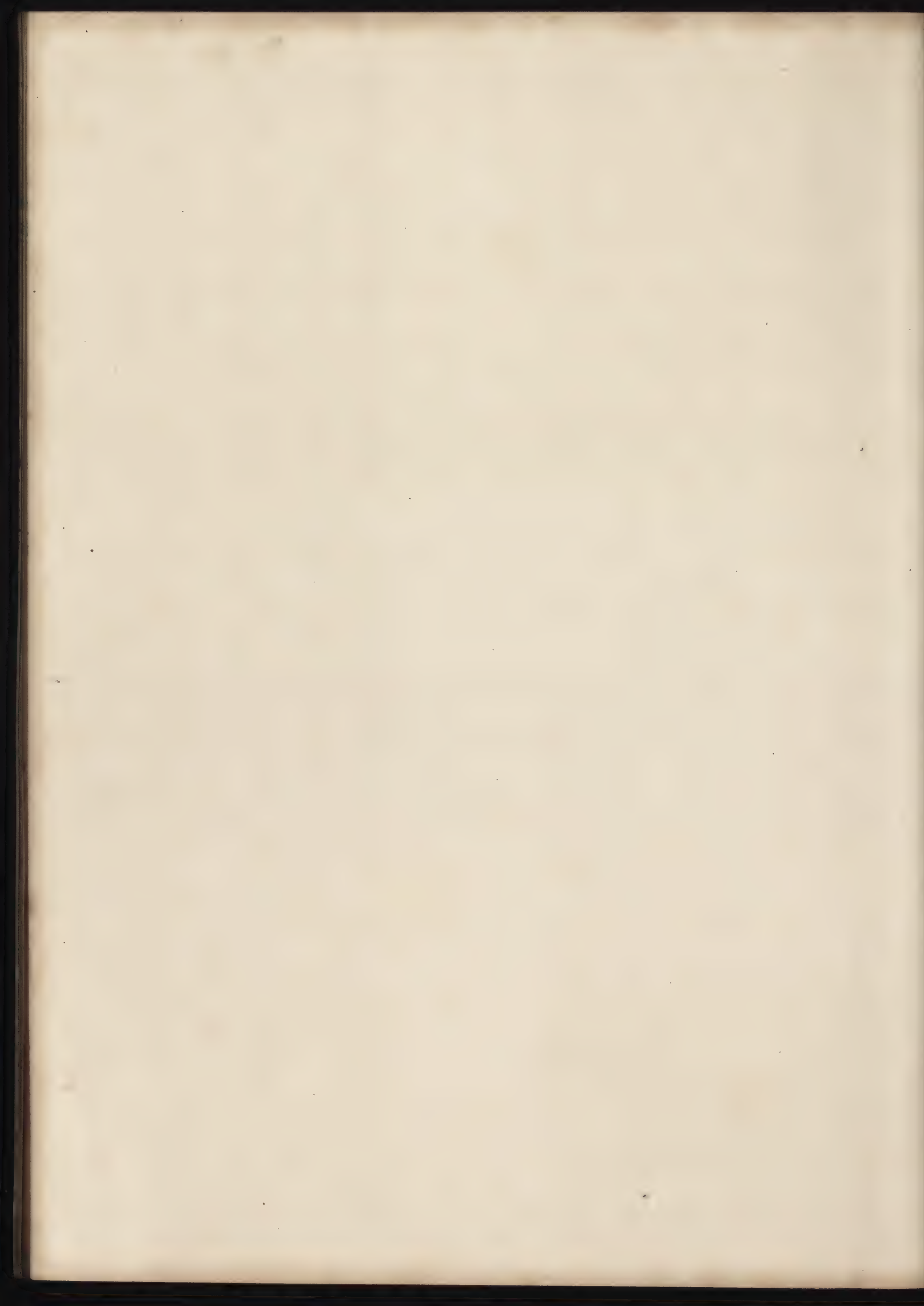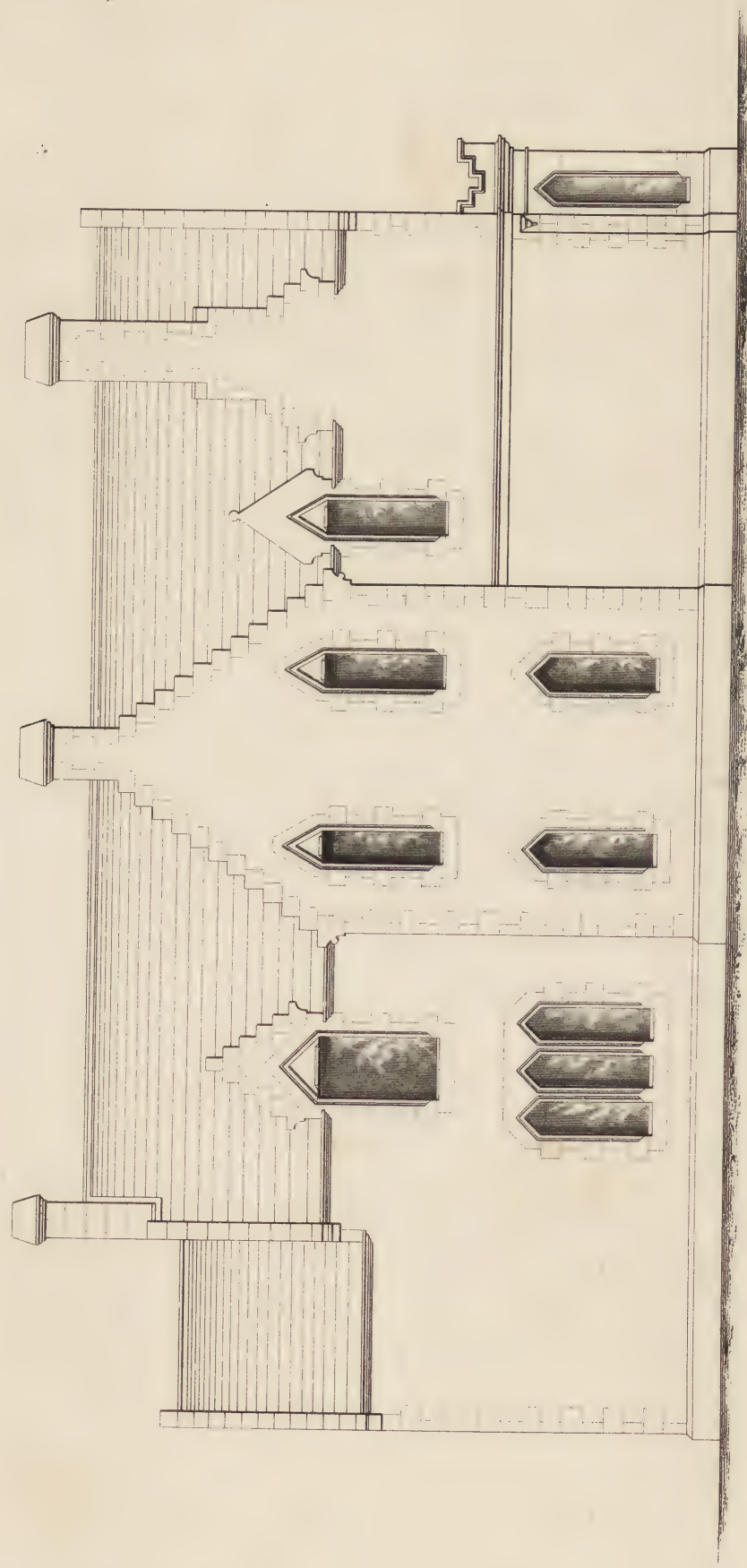
20   5   0   10   20   30   40 FEET

PLATE 2

SIDE ELEVATION

Plate 3

OLD SCOTCH VILLA

SECTION AT A. B.

PLATE II 4

OLD SCOTCH VILLA.

PLAN OF ROOF.

WILLIAM MACKENZIE, GLASGOW, EDINBURGH & LONDON.

10   5   0   10   20   30   40   50 FEET

B

Sink

SCULLERY

PRIVY

ASHES

COURT

COALS

KITCHEN
17'·6" × 15'·0"

STORE
15'·0" × 8'·3"

PASSAGE

MORNING ROOM
16'·0" × 16'·0"

BUTLER'S PANTRY
15'·0" × 8'·3"

STAIRCASE

DINING ROOM
21'·3" × 15'·0"

DRAWING ROOM
22'·0" × 16'·0"

VESTIBULE

A

GROUND PLAN

10   5   0   10   20   30   40 FEET

SERVANTS' ROOM

NURSERY
17'-6" × 15'-0"

BEDROOM
17'-0" × 15'-0"

PASSAGE

BEDROOM
16'-0" × 12'-0"

BEDROOM
11'-0" × 10'-6"

BATH & W.C.
10'-0" × 7'-0"

LANDING

BEDROOM
15'-0" × 13'-9"

BEDROOM
11'-0" × 11'-0"

BEDROOM
16'-0" × 15'-0"

BEDROOM PLAN

10　　5　　0　　　10　　　　20　　　　30　　　40 FEET
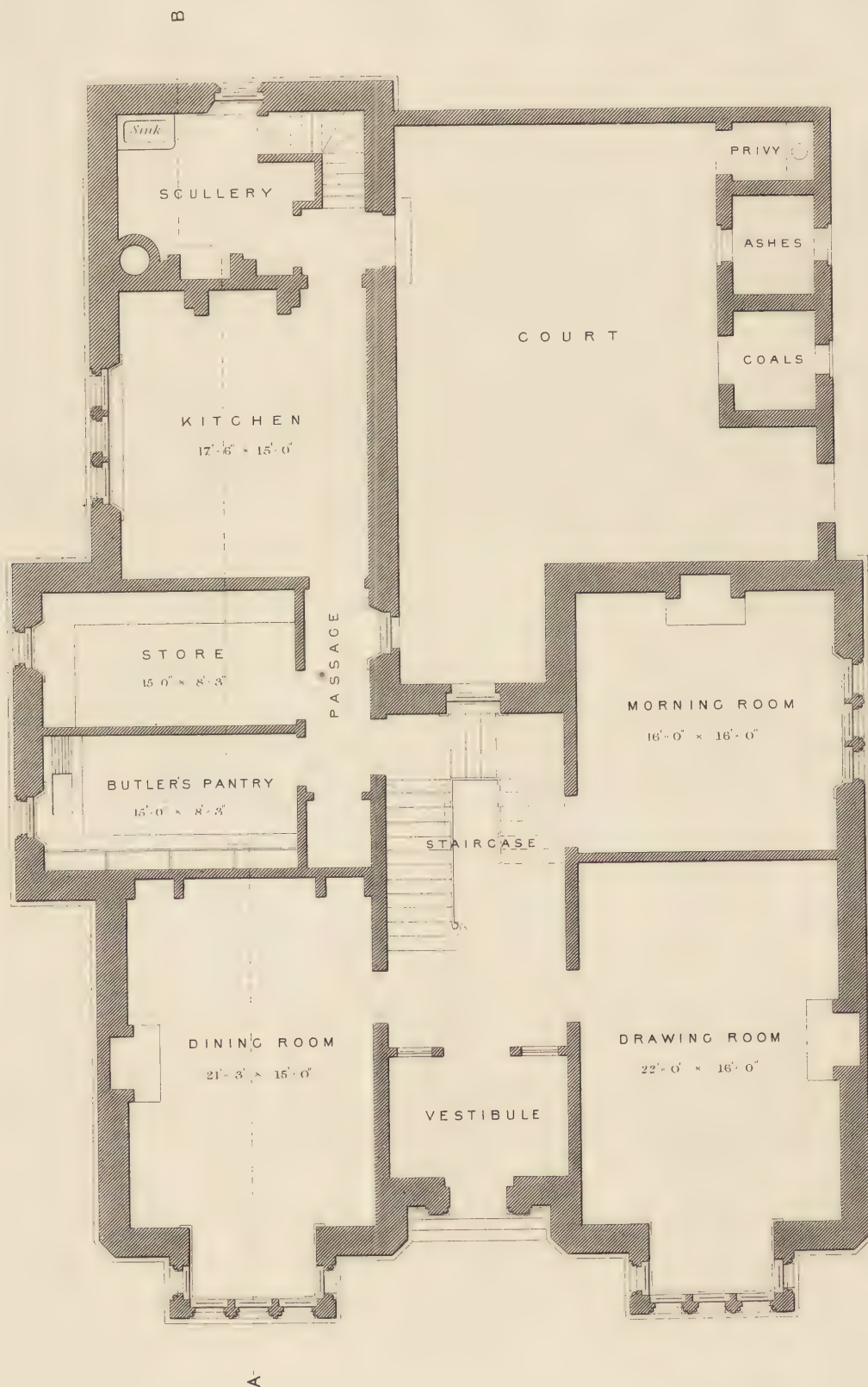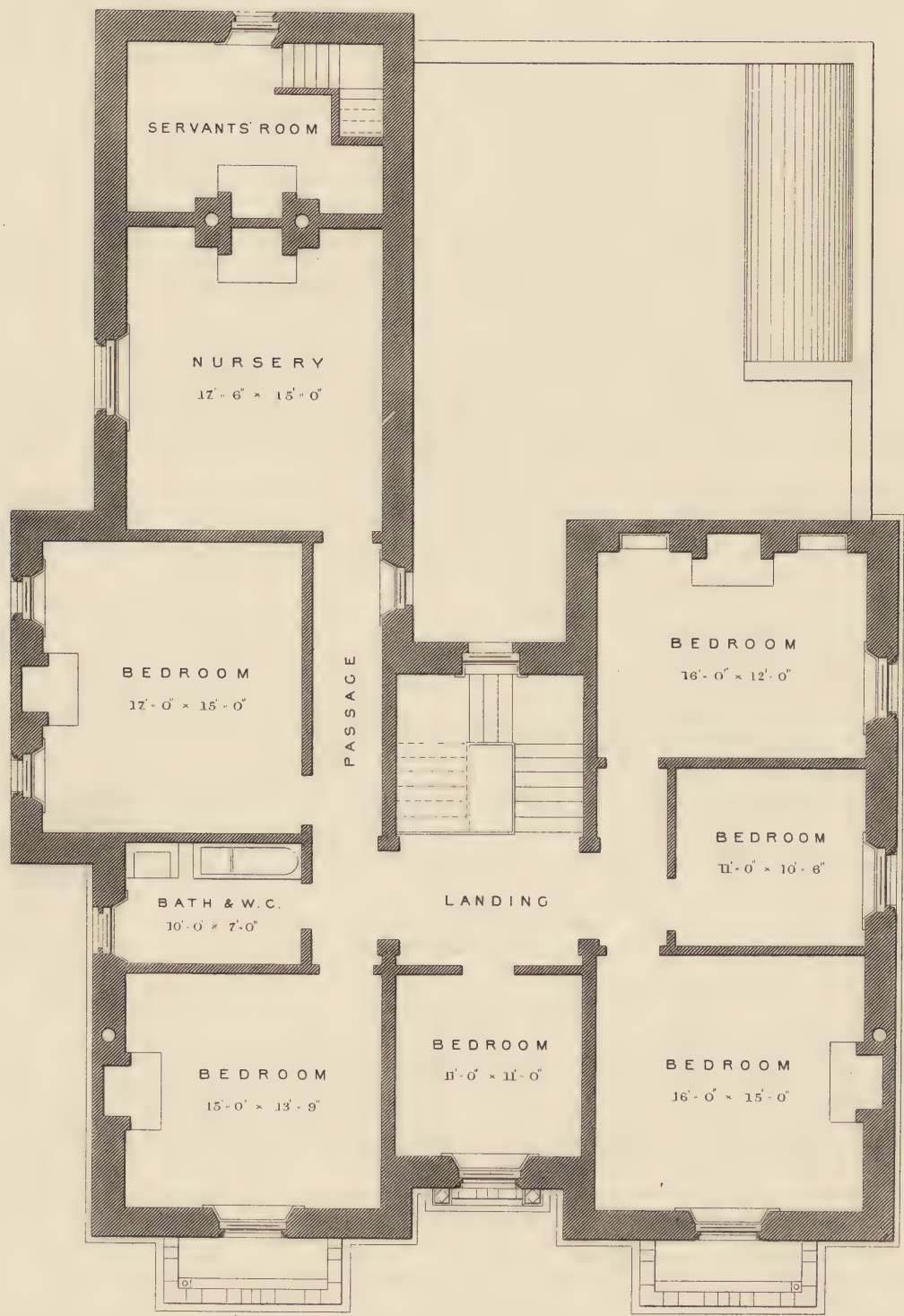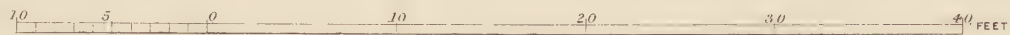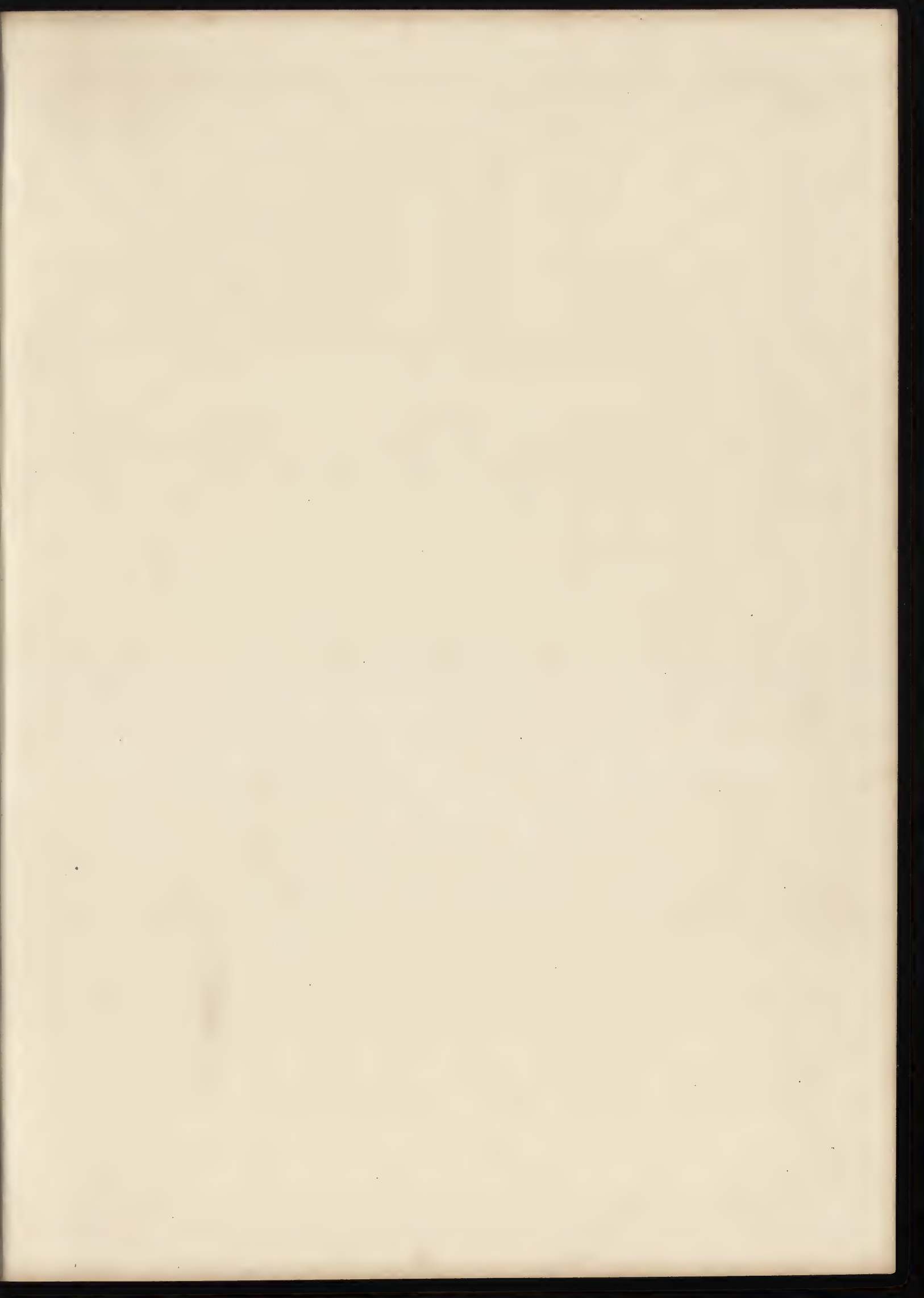
OLD SCOTCH VILLA

FIRST FLOOR WINDOW
IN FRONT GABLE

DETAILS

CHIMNEY HEAD

FRONT DORMER
WINDOW
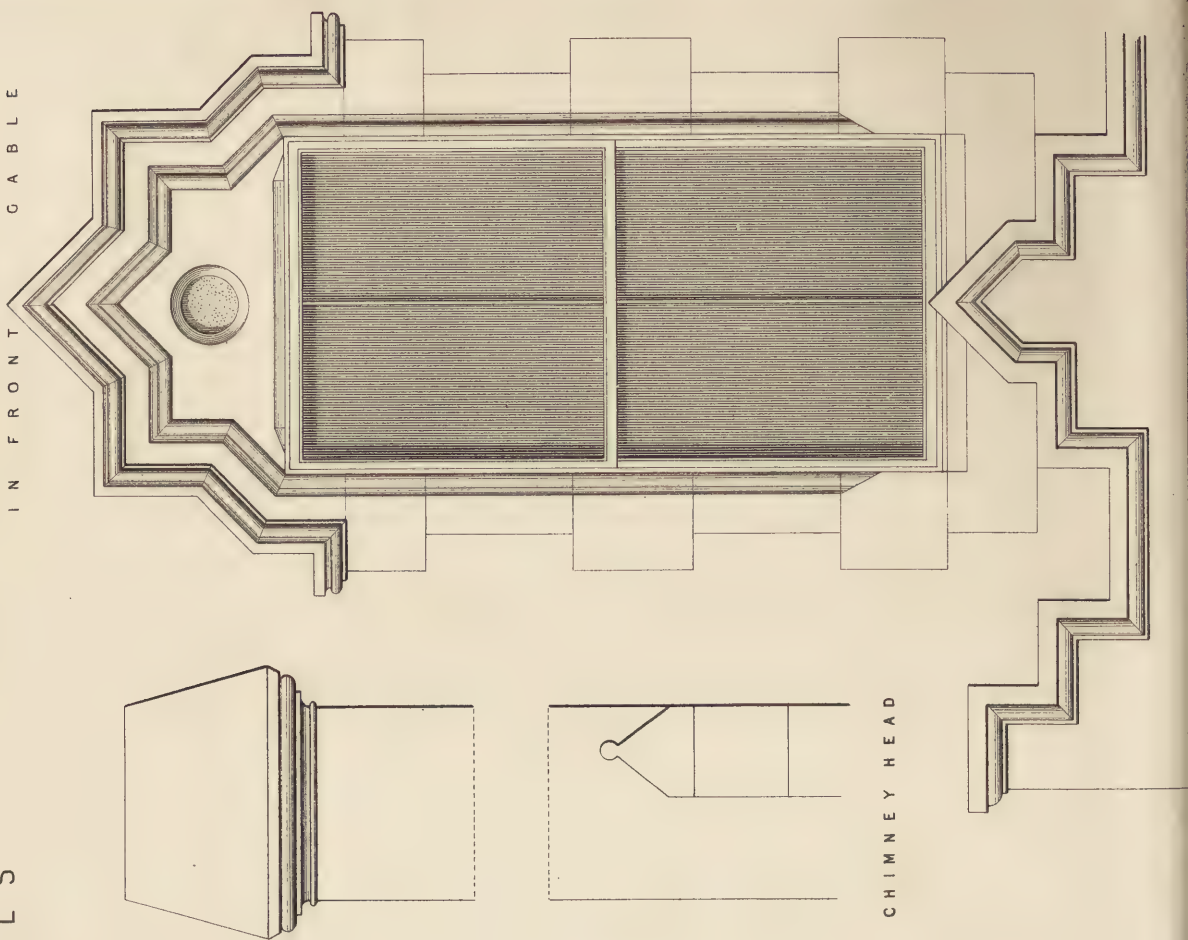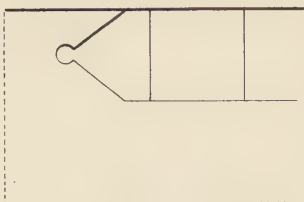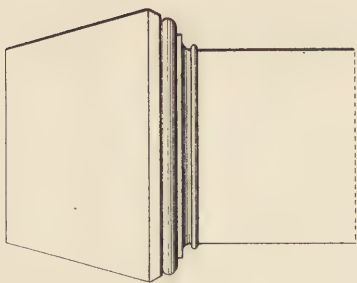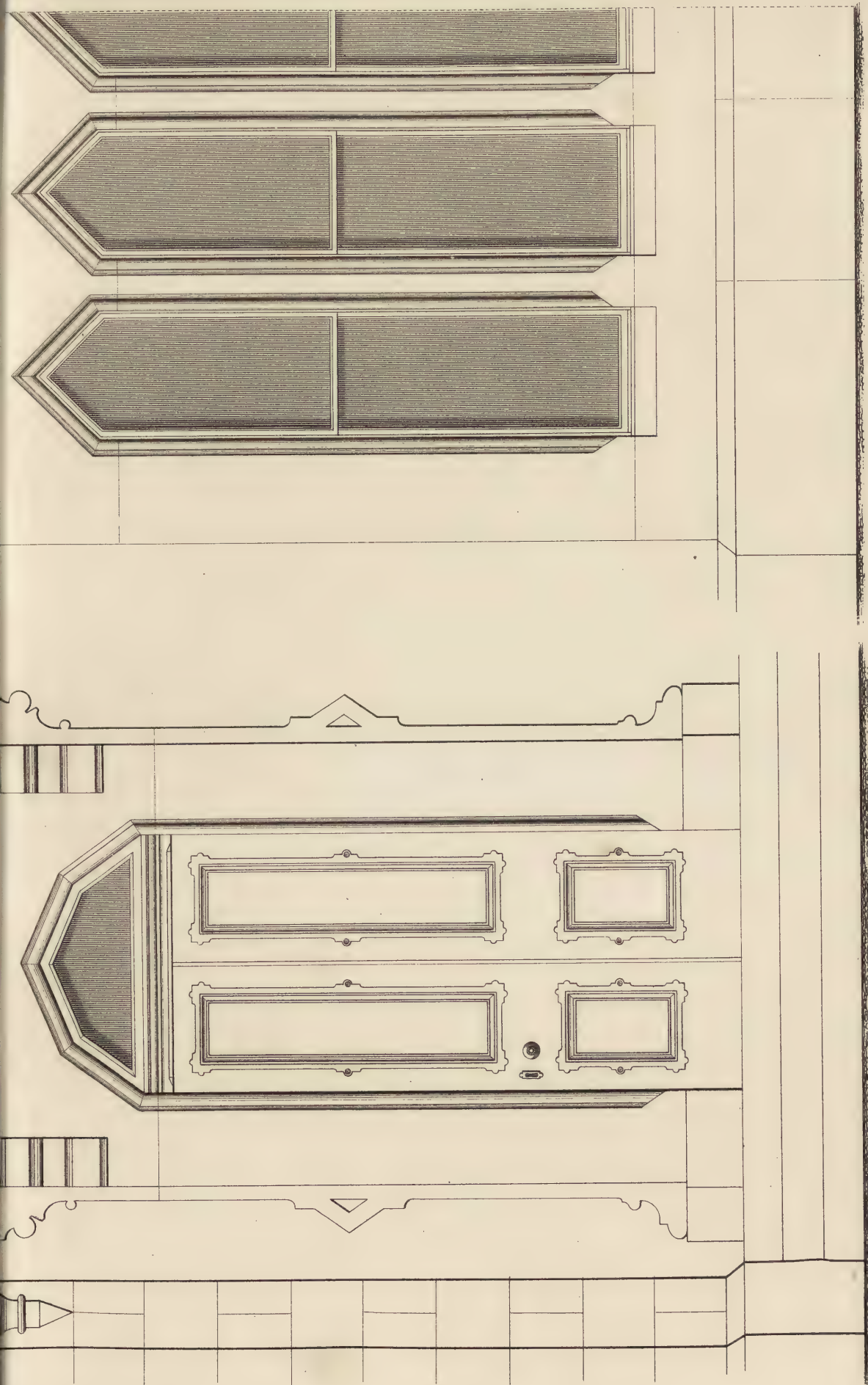
BAY WINDOW

ENTRANCE DOORWAY

LNS. 12 6 0 1 2 3 4 5 6 7 8 9 10 FEET
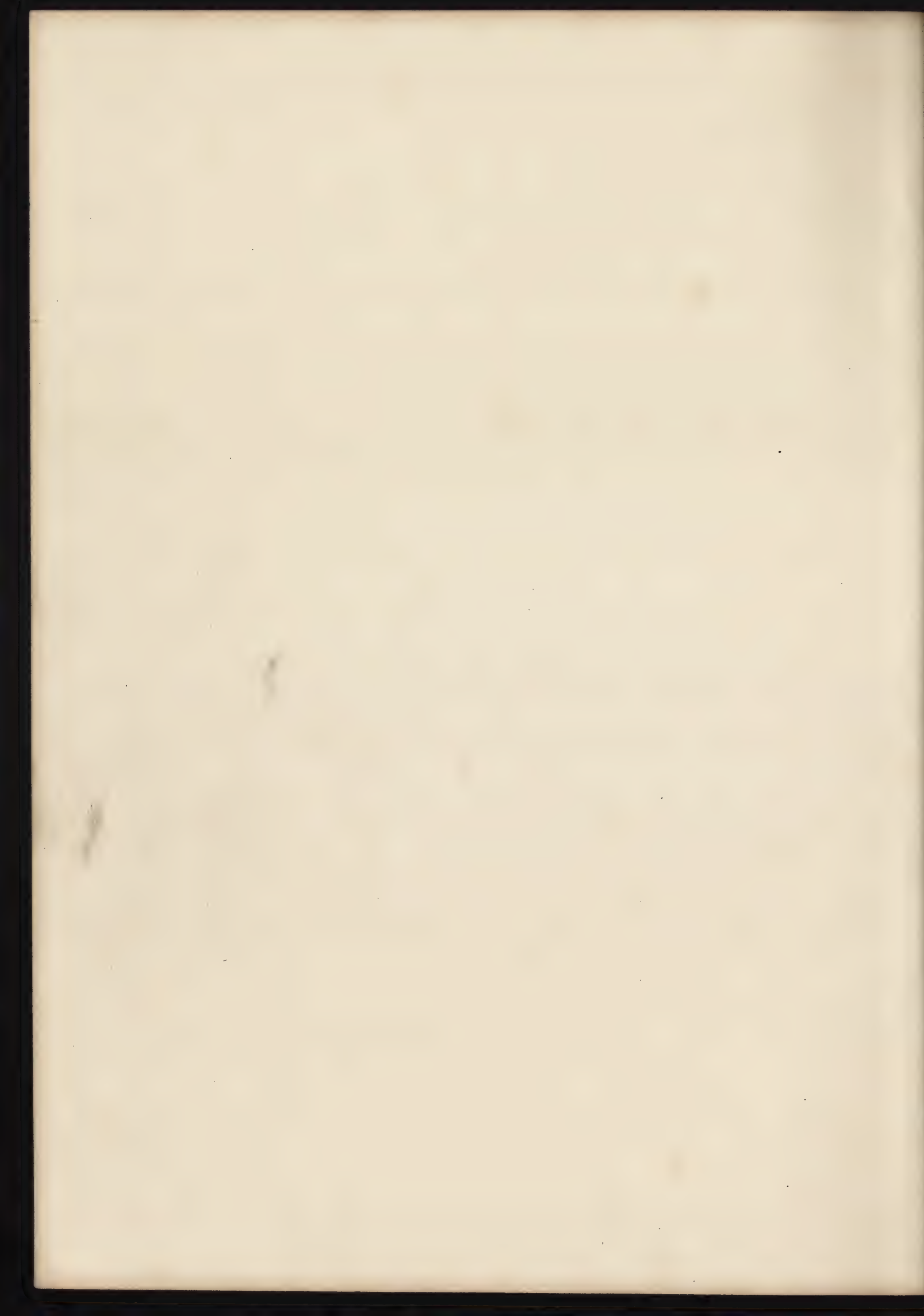
PLATES $\frac{M}{1}$ — $\frac{M}{7}$.

DESIGN FOR A SMALL VILLA IN THE OLD SCOTCH STYLE.

PLATES $\frac{M}{1}$ — $\frac{M}{7}$ contain Ground Plan, Bedroom Plan, Front Elevation, Side Elevation, Section, and Roof Plan of a small Villa designed in the Old Scotch style. It contains all the apartments and conveniences necessary for a comfortable dwelling, and its external ornamental features are of the simplest character.

The Design is shewn to be built of stone throughout; the doorway and window finishings, the base course, string course, quoins, crow steps, and chimney cappings to be of dressed stone, and the general walls to be of parpoint rubble in narrow courses.

The roofs may either be covered with plain or ornamental slates. Fig. VI., Plate $\frac{M}{7}$, is a suitable pattern of slating for an Old Scotch house.

The front windows and the window of morning room to be filled in with plate glass, the remaining ones to be filled with sheet in large squares.

PLATES $\frac{M}{5}$ — $\frac{M}{6}$.—GROUND PLAN.—The Ground Floor contains a large vestibule and hall, dining room, drawing room, morning or breakfast room, kitchen, scullery, store room, and butler's pantry.

The vestibule measures 11 feet by 7 feet 6 inches, and opens into the hall in which is placed the staircase. The latter has treads 4 feet wide.

The dining room opens off the hall and measures 21 feet 3 inches by 15 feet, exclusive of projecting window. The dining room has a sideboard recess and two small cupboards.

The drawing room measures 22 feet by 16 feet, exclusive of its window, which is 8 feet by 4 feet 6 inches.

The morning room measures 16 feet by 16 feet.

A door underneath the stair opens into the passage which communicates with the kitchen, butler's pantry, and store room.

DESIGN FOR A SMALL VILLA IN THE OLD SCOTCH STYLE.

The kitchen measures 17 feet 6 inches by 15 feet, and has a scullery attached, fitted up with a boiler and sink.

The outbuildings comprise a coal-house, ash-pit, and privy.

Wine and beer cellars, &c., to be excavated underneath the hall and dining room. The cellar stairs are shewn placed underneath the first flight of the principal stair.

The height of the Ground Floor is 12 feet.

BEDROOM PLAN.—On the Bedroom Floor there are four main bedrooms, two small ones, a nursery and bath-room. Over the scullery is provided a servants' bedroom having a separate stair from the kitchen lobby.

The height of the Bedroom Floor is 11 feet.

PLATES $\frac{M}{1}$ — $\frac{M}{2}$ contain Front and Side Elevations. The latter shewing the projecting gable on the left of the front gables and the kitchen wing behind.

PLATES $\frac{M}{3}$ — $\frac{M}{4}$ contain Section and Roof Plan. The Section is cut on the line A—B shewn on the plans. The Roof is drawn indicating one half slated and the other in naked timbers.

SEMI-DETACHED COTTAGES.

ELEVATION

WILLIAM MACLAINE, GLASGOW LITHOGRAPHER & &c.
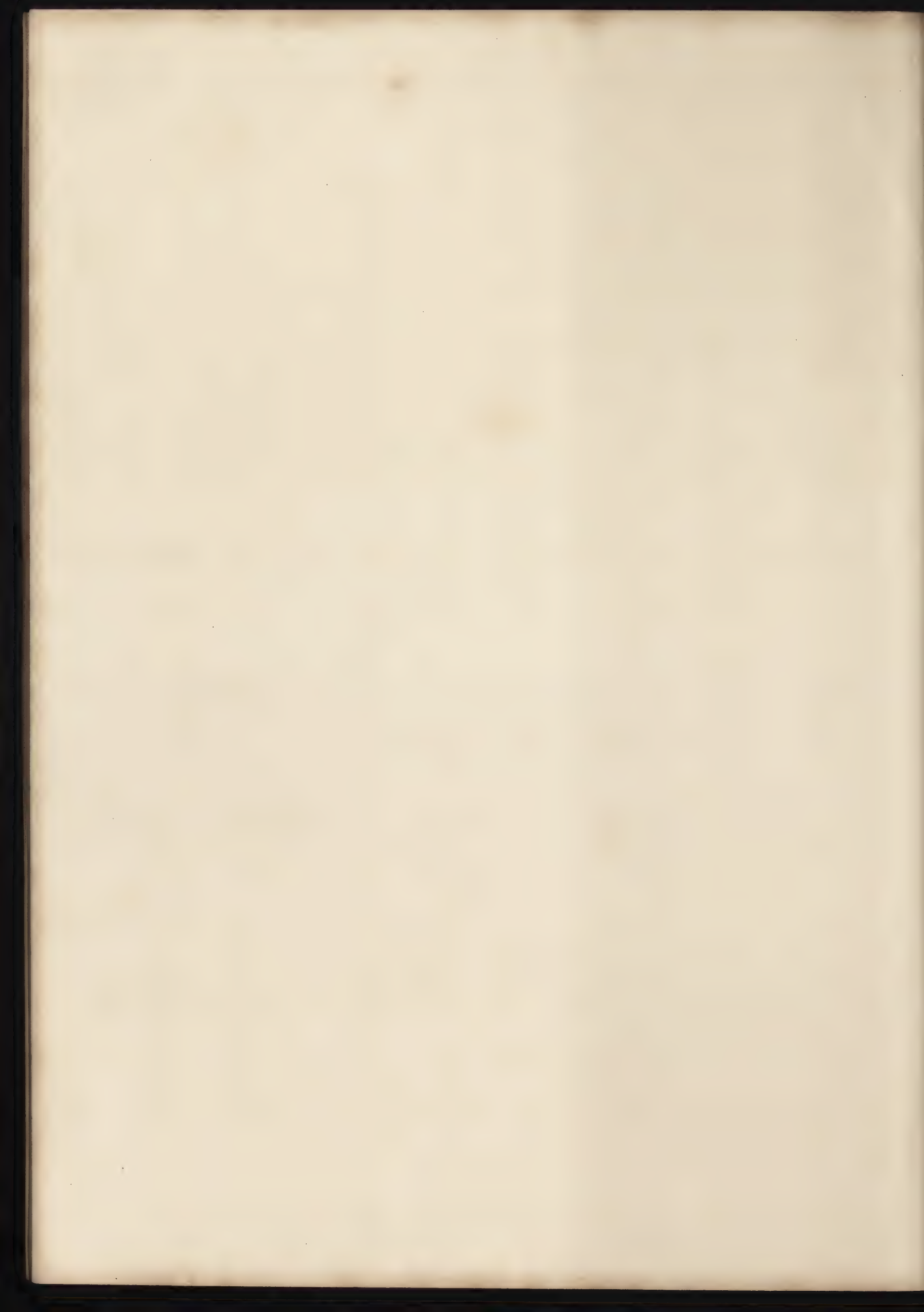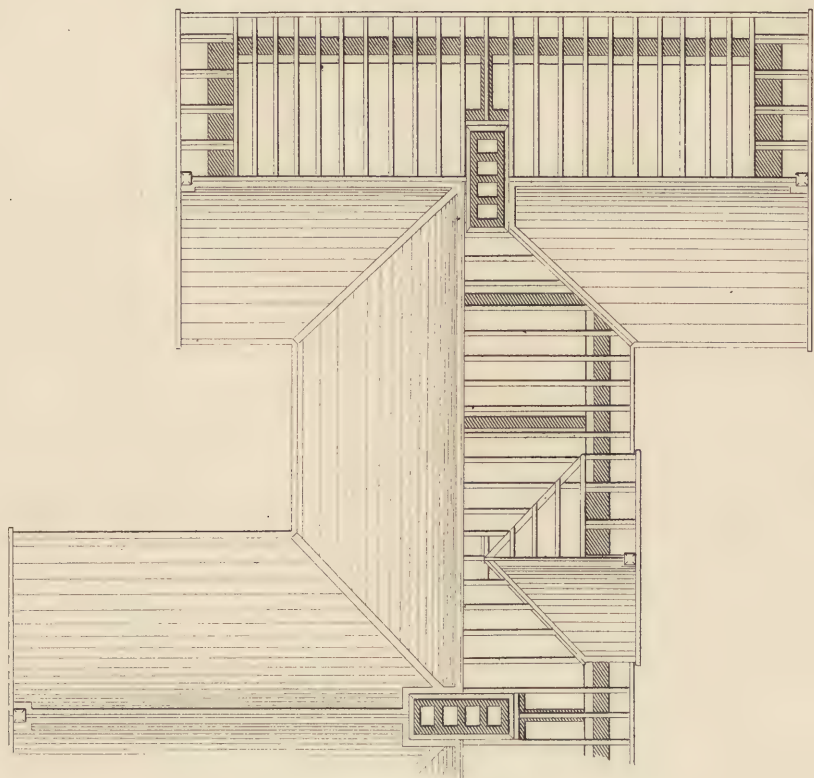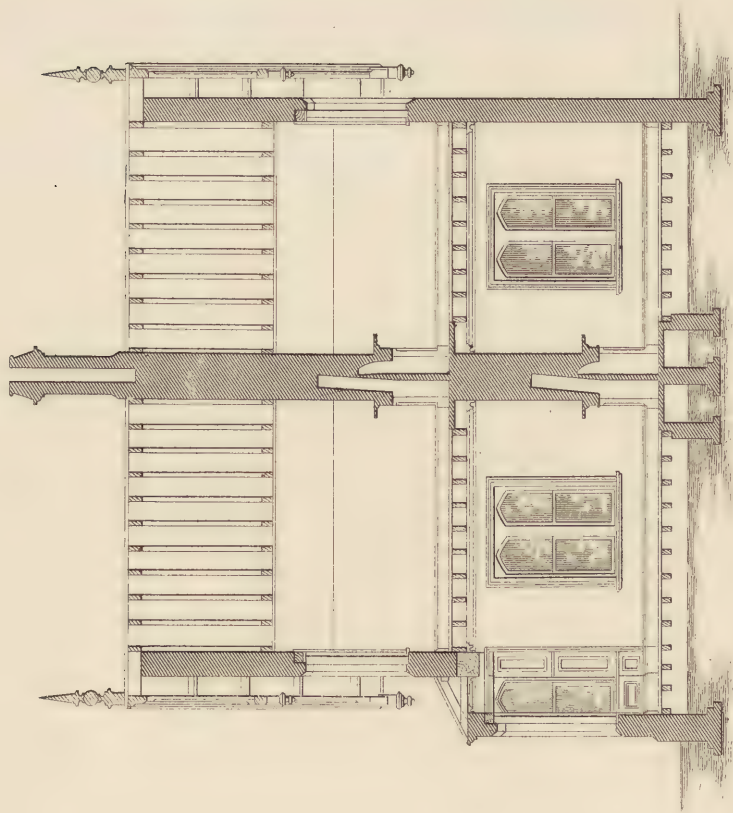
30 FEET

SEMI-DETACHED COTTAGES

ROOF PLAN

SECTION AT A.B.

30 FEET

BEDROOM
13' × 12'

BEDROOM
14' × 12'

LANDING

BEDROOM
14'·9" × 13'·0'

BEDROOM
14' × 7'

BEDROOM
14' × 7'

BEDROOM
14'·9" × 13'·0'

LANDING

BEDROOM
13' × 12'

BEDROOM
14' × 12'

B

A

BEDROOM PLAN

WILLIAM MACKENZE GLASGOW EDINBURGH & LONDON

10   5   0   10   20   30 FEET

PRIVY

ASHES

COALS

PARLOR
13' × 12'

PARLOR
14' × 12'

PORCH

PANTRY

SCULLERY
9'-6" × 7'-0"

KITCHEN
14'-6" × 13'-0"

PANTRY

SCULLERY
9'-6" × 7'-0"

KITCHEN
14'-6" × 13'-0"

PRIVY

ASHES

COALS

PARLOR
13' × 12'

PARLOR
14' × 12'

PORCH

B

A

GROUND PLAN

10   5   0   10   20   30 FEET
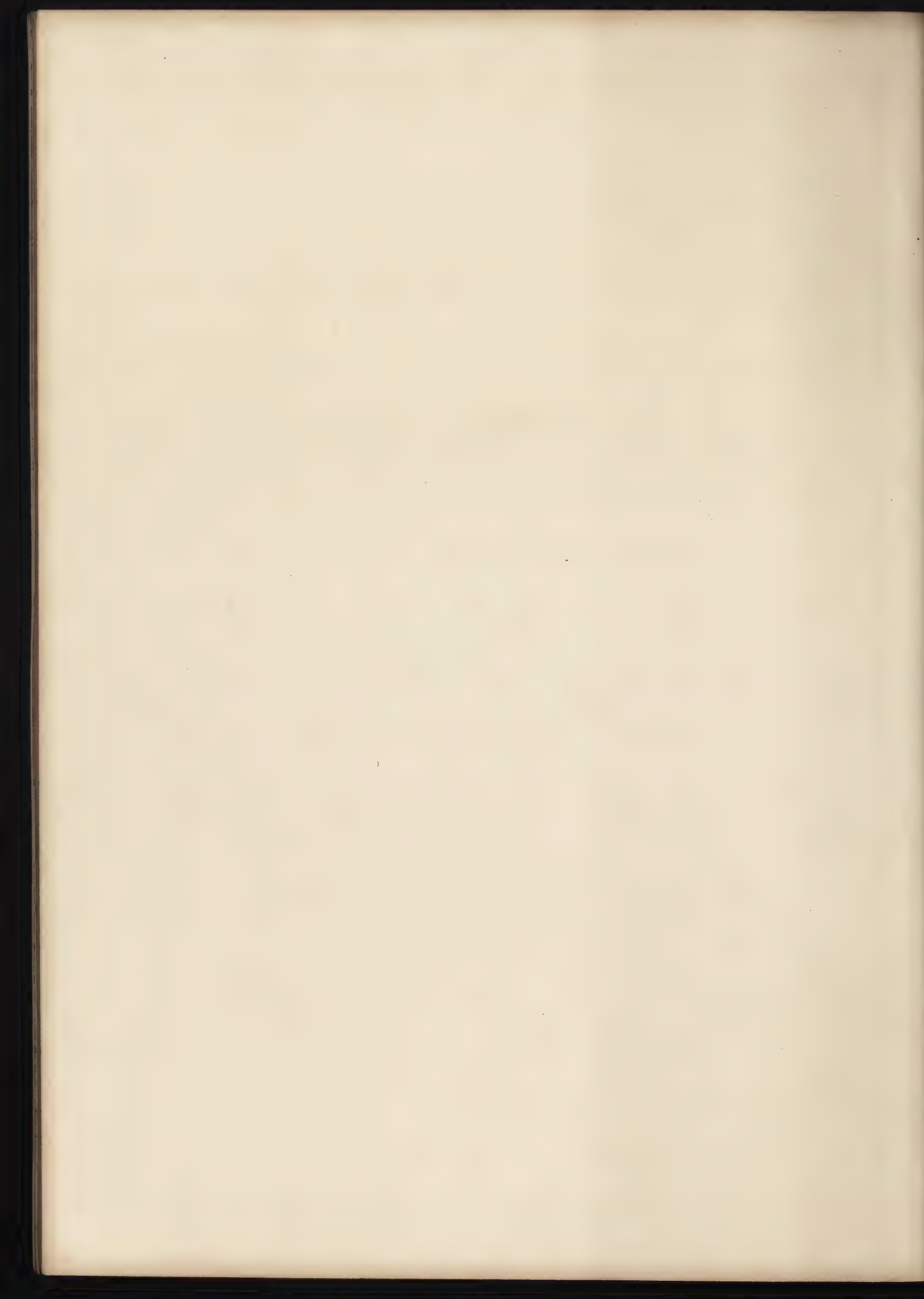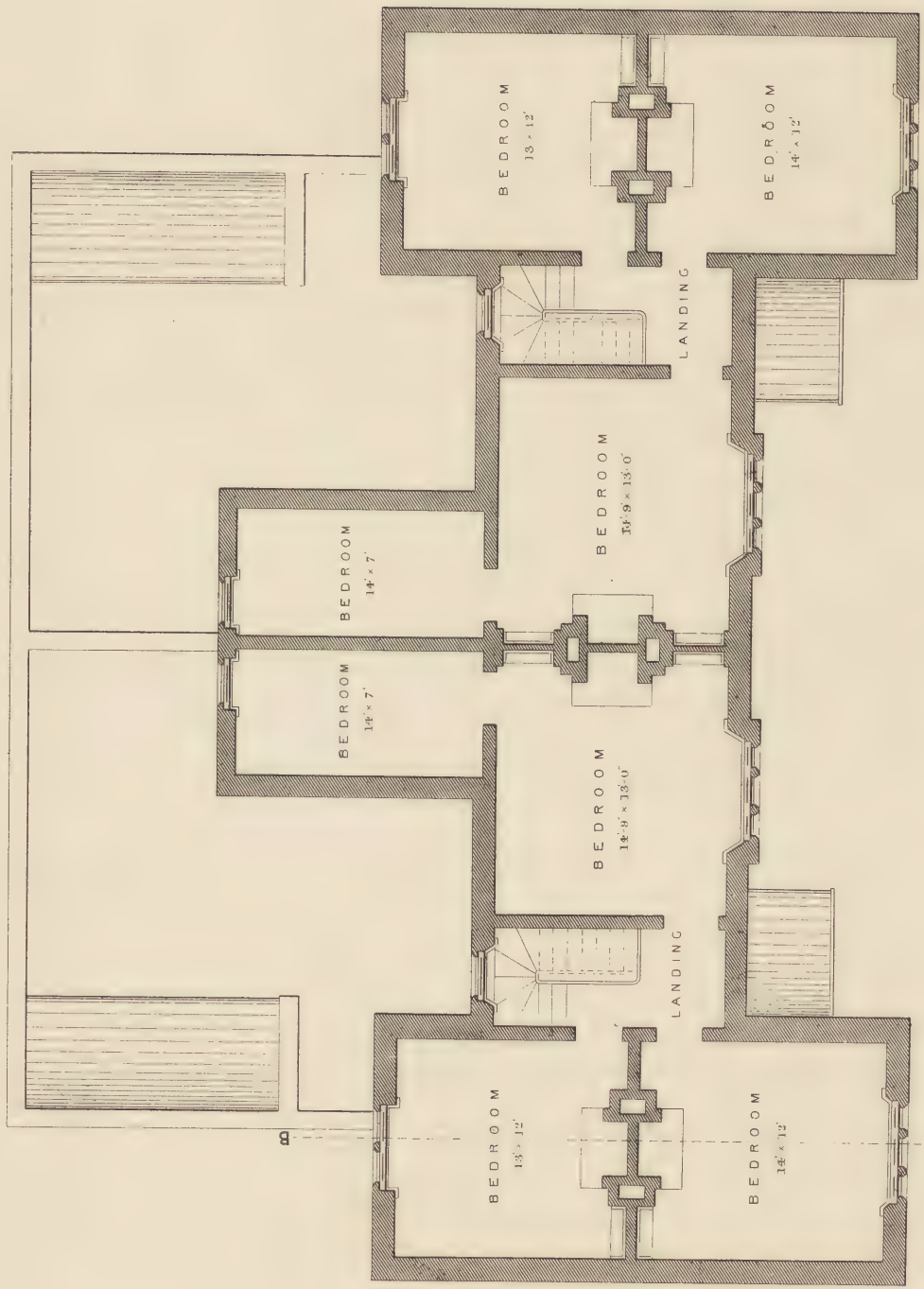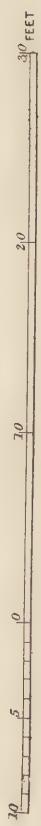
WILLIAM MACKENZIE GLASGOW EDINBURGH & LONDON
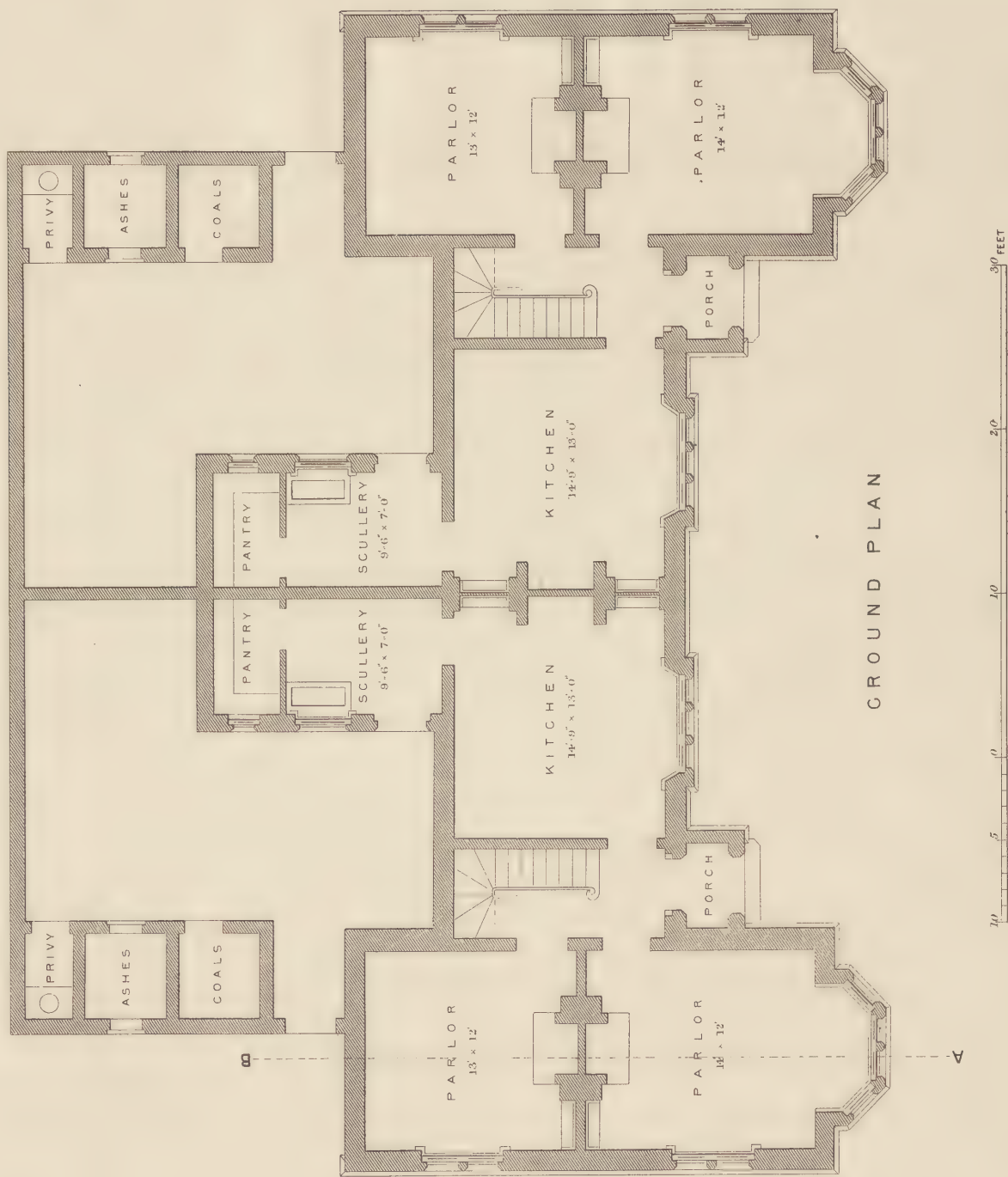
DESIGN FOR TWO SEMI-DETACHED COTTAGES.

PLATES $\frac{N}{1}$ — $\frac{N}{4}$ shew Ground Plan, Bedroom Plan, Elevation, Section, and Roof Plan of two semi-detached Cottages, designed in a very simple treatment of the Gothic style.

The Cottages are shewn in the drawings to be executed with brick, having stone quoins on all angles, and stone finishings to the doors, windows, base-course, and chimney heads.

The doorways and the window openings have plain splays. The angle quoins have splays finishing at top and bottom with sloping stops, as shewn on the Elevation.

The principal ornamental features in the Design are the projecting roofs, the woodwork of which is dressed and stop-chamfered, having finials and pendants where shewn. These roofs should be stained of a dark colour and well varnished.

The windows may either be filled with plain sheet glass in large panes, as indicated by the Section, or with ornamental leaded glass.

PLATES $\frac{N}{3}$ — $\frac{N}{4}$.—GROUND PLAN.—Both the Cottages are in every particular, externally and internally, alike, except as regards the positions of their several features, which are reversed.

The entrance doors are protected by open Porches, and give access to the lobbies, which are 5 feet 6 inches wide. From these lobbies the parlours and kitchens open.

The front parlours measure 14 feet by 12 feet, exclusive of bay windows. The back parlours measure 13 feet by 12 feet. All the principal rooms throughout the Cottages have convenient cupboards.

The kitchens measure 14 feet 9 inches by 13 feet; and the sculleries to the rear measure 9 feet 6 inches by 7 feet, and have each a large and convenient pantry attached. Sinks are also placed under the windows of the sculleries.
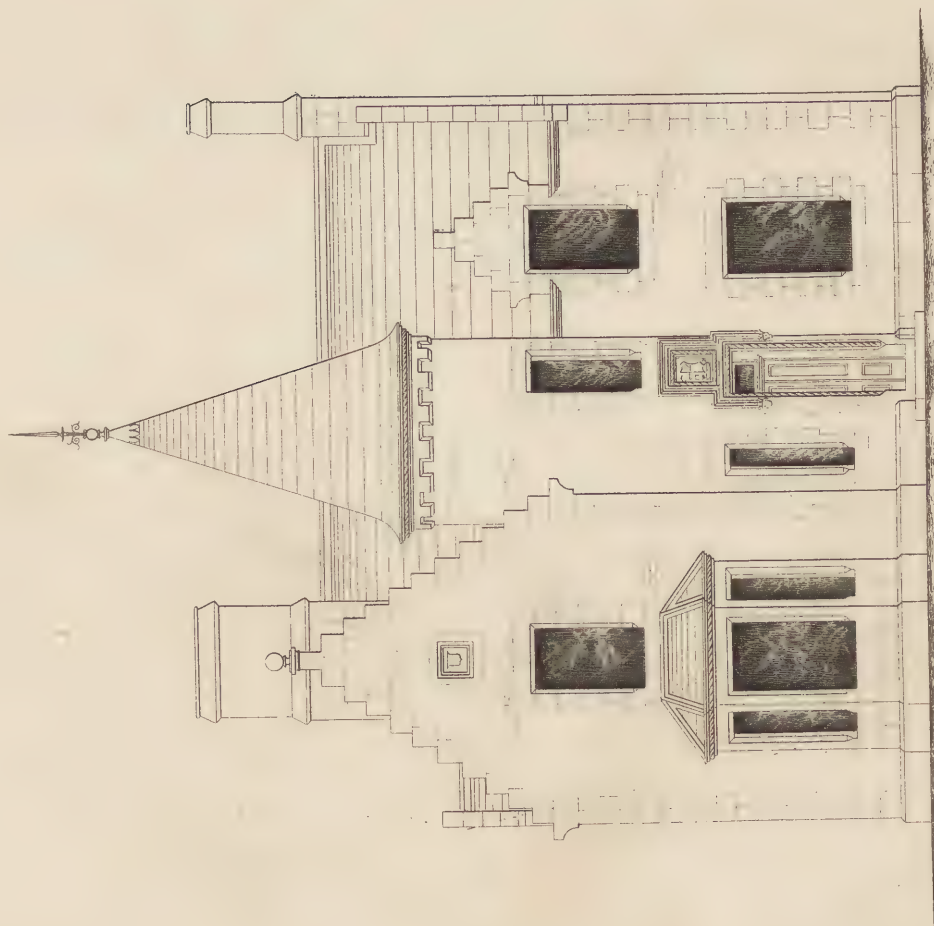
DESIGN FOR TWO SEMI-DETACHED COTTAGES.

Coal-houses, ash-pits, and privies are provided in out-buildings.
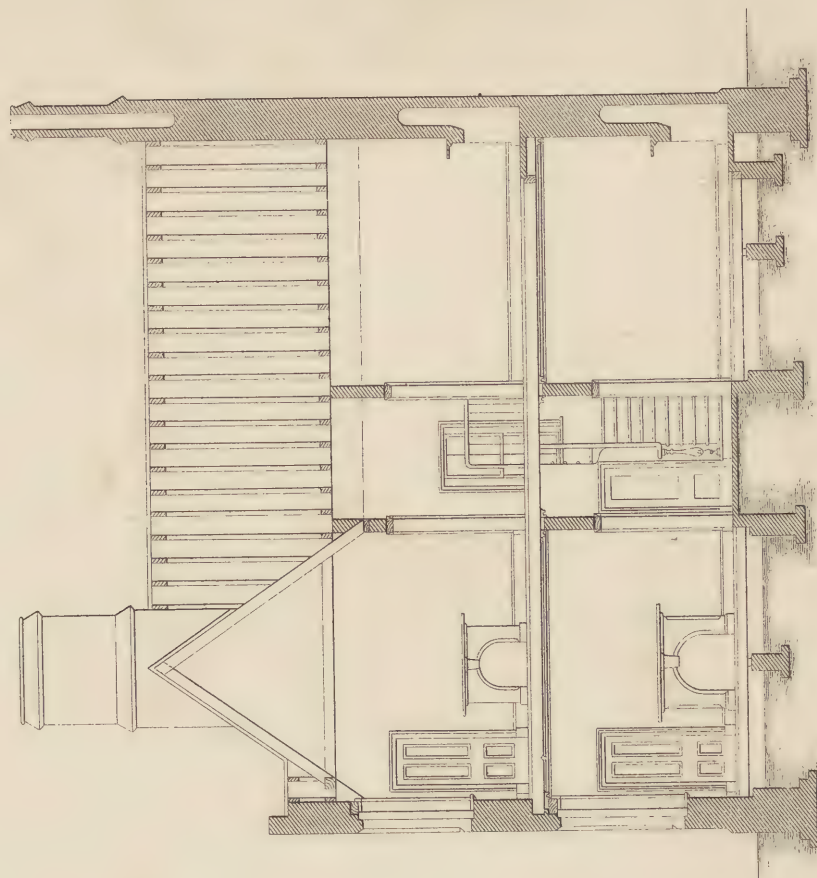
The height of the Ground Floor is 10 feet.

BEDROOM PLAN.—There are four good bedrooms, to each Cottage, of the size of the respective rooms on the Ground Floor, with the exception of the bedroom over the scullery, which extends over the pantry and measures 14 feet by 7 feet.
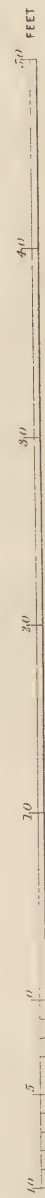
The height of the Bedroom Floor is 9 feet.

PLATES $\frac{N}{1}$ — $\frac{N}{2}$ contain the Front Elevation, shewing both Cottages complete: the Section, cut on the line A—B (on the Plans), shewing the interior finishings of the bay window, and the other windows of the front and back parlours; and a Roof Plan of one Cottage, shewing one half slated and the other half in the naked timbers.

SECTION AT A.B.

ELEVATION

FEET

W... AM MA ... ... GLASGOW DAB ... ...

BEDROOM PLAN

BEDROOM
15'·0" × 13'·4"

LANDING

CLOSET

BEDROOM
14'·0" × 12'·3"

BEDROOM
16' × 14'

A

B

GROUND PLAN

PRIVY

ASHES

COALS

COURT

PARLOR
15' × 13'

SCULLERY
10' × 9'

CLOSET LOBBY

KITCHEN
14'·0" × 12'·3"

LOBBY

PORCH

PARLOR
16' × 14'

A

B

FEET
10   5   0   10   20   30   40   50
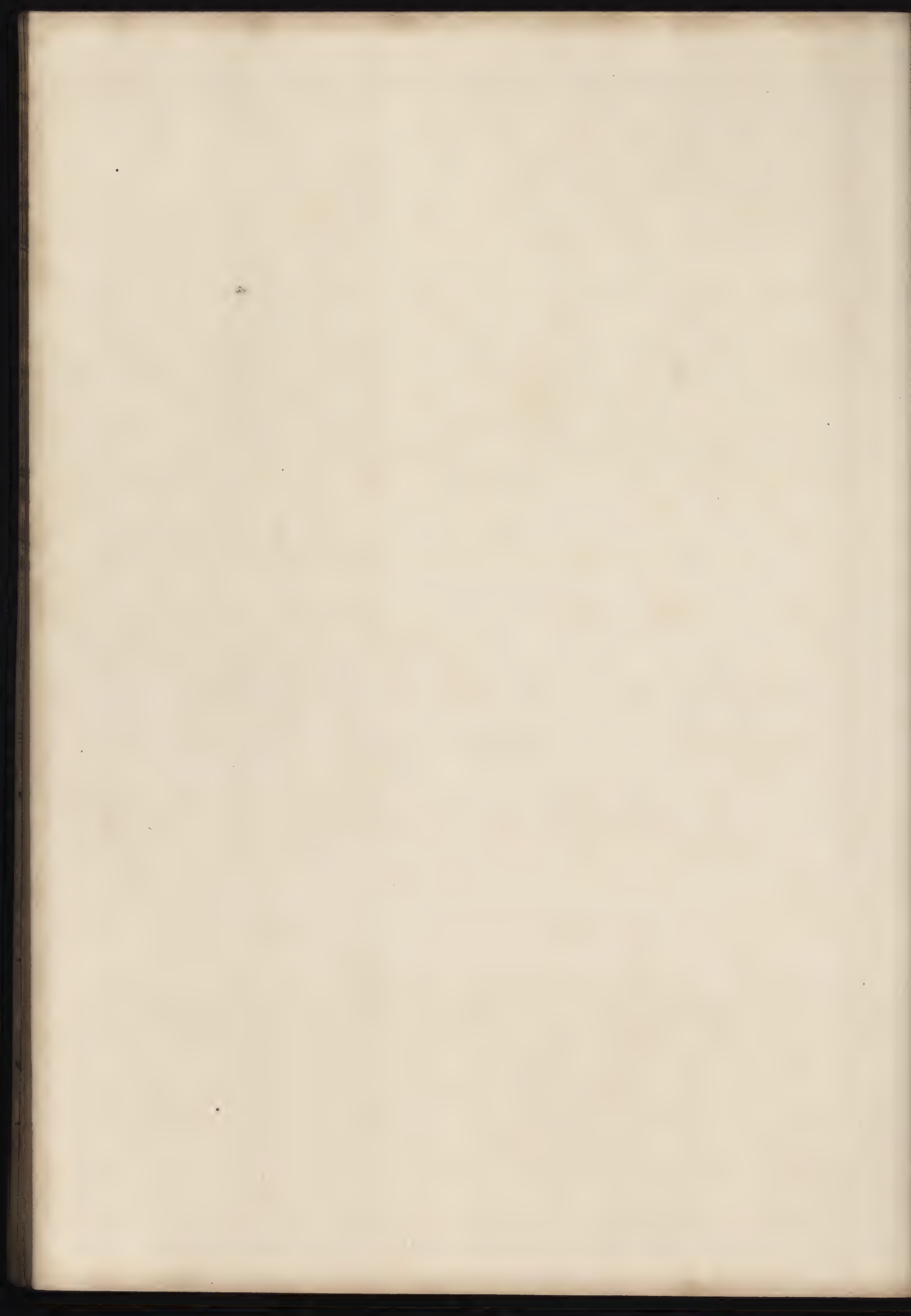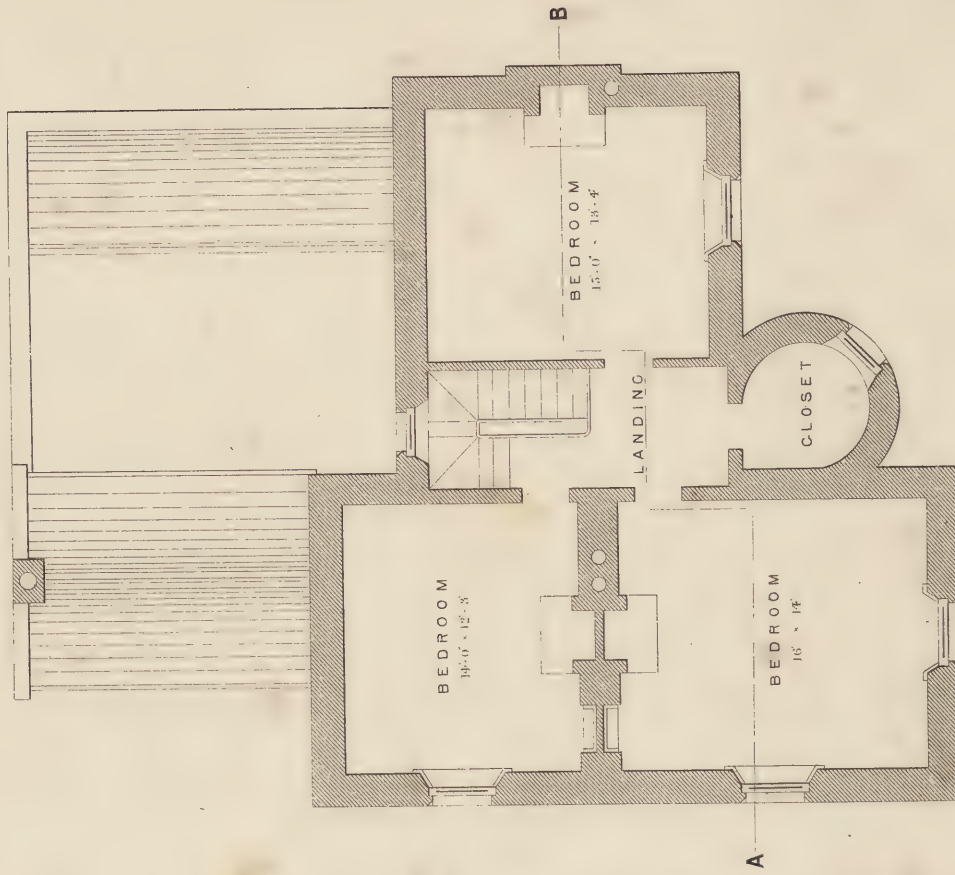
WILLIAM MACKENZIE GLASGOW EDINBURGH & LONDON.
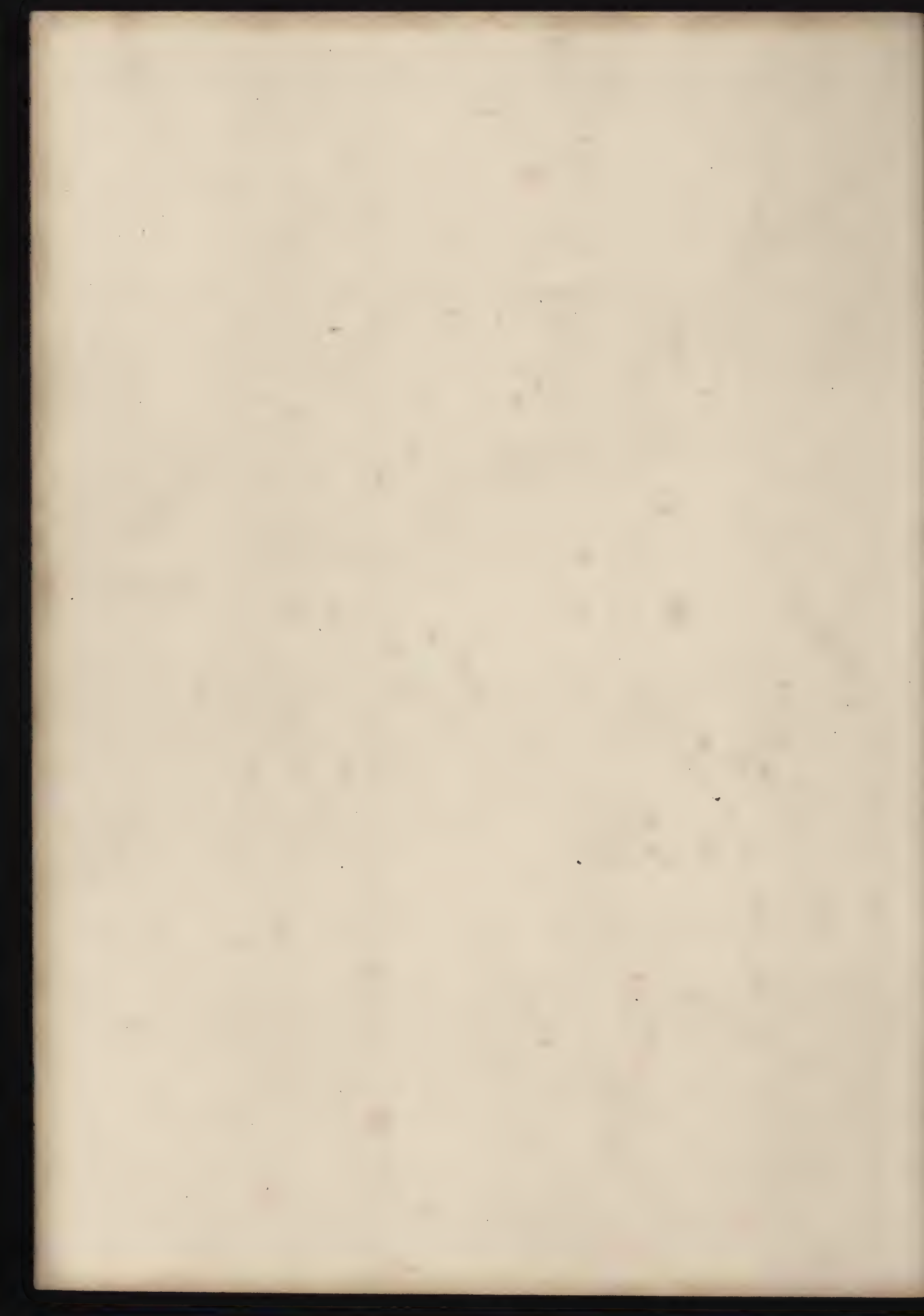
DETAILS

TERMINAL OF   FRONT GABLE
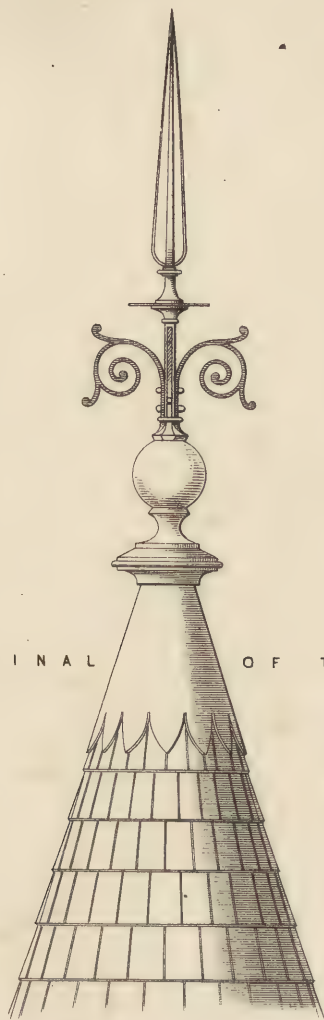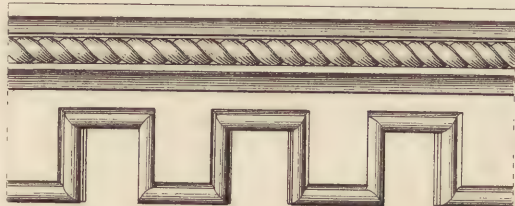
TERMINAL   OF   TOWER

CORNICE OF TOWER

CHIMNEY PIECE

DOORWAY IN TOWER

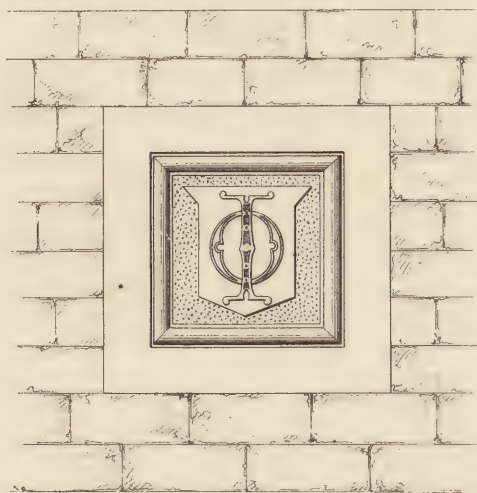INS 12 6 0   1   2   3   4   5   6   7 FEET
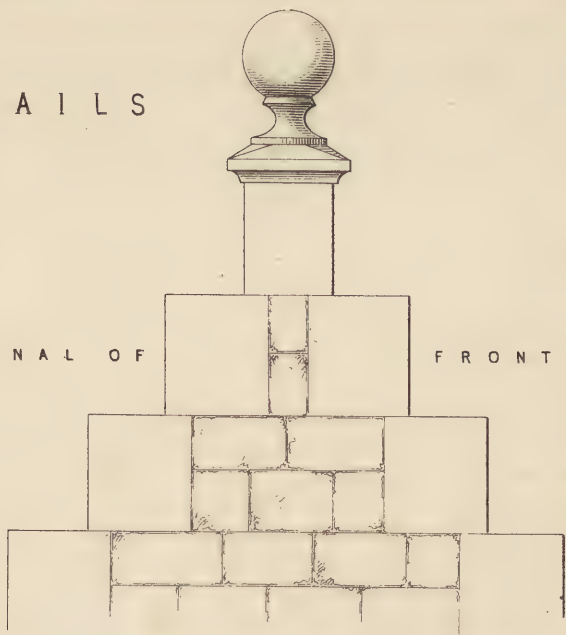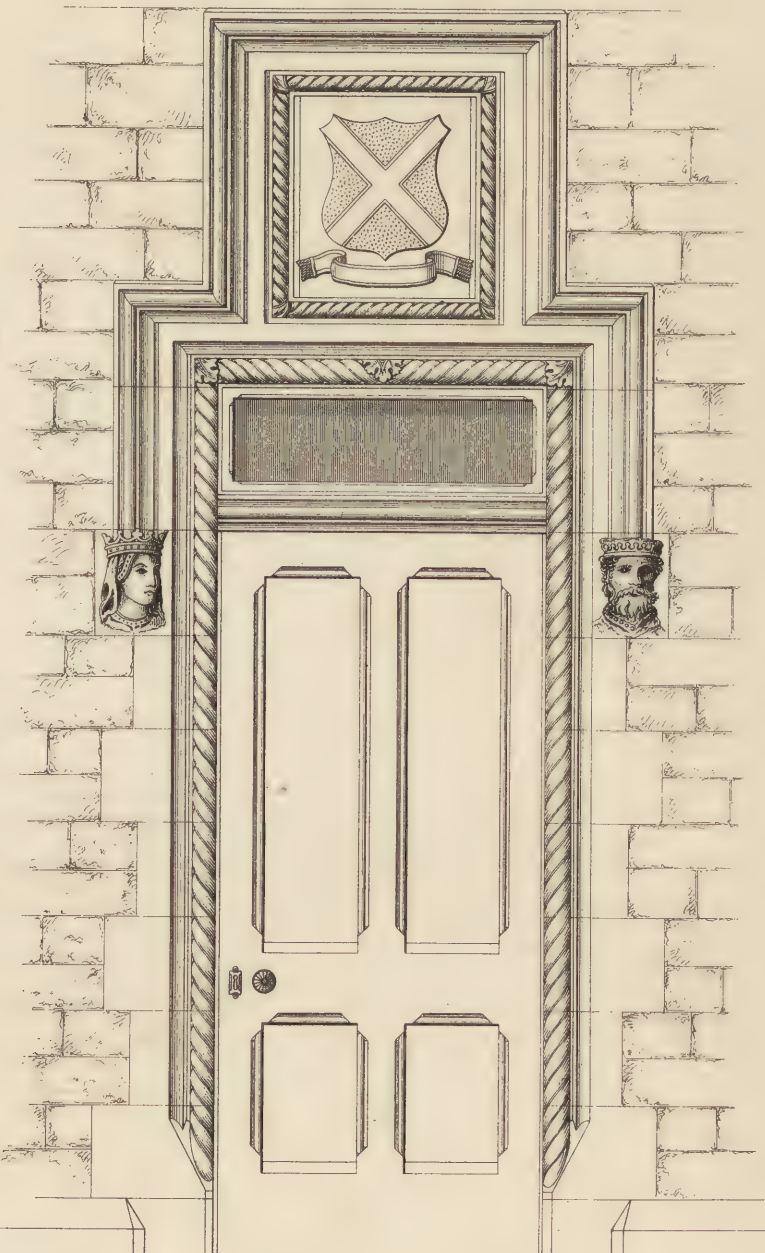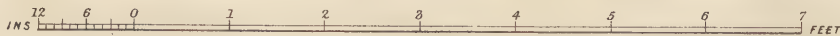
DETAILS
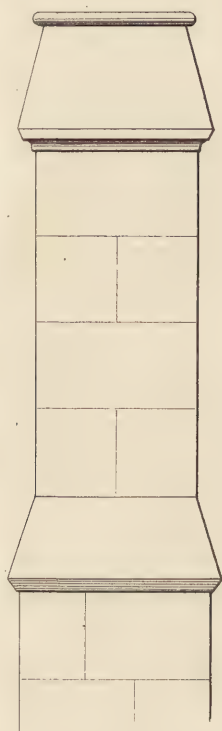
SECTION

CORNICE OF BOW WINDOW

CHIMNEY HEAD
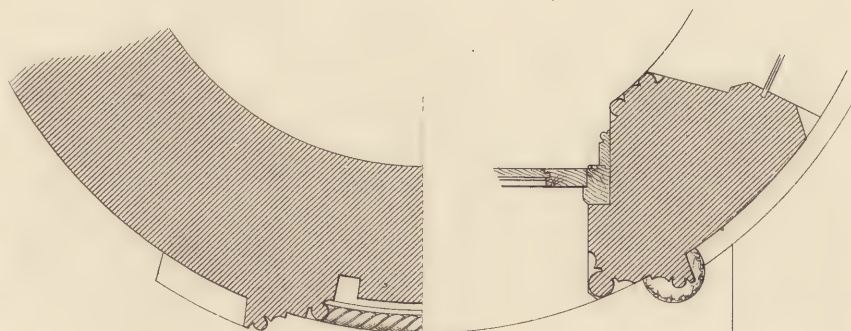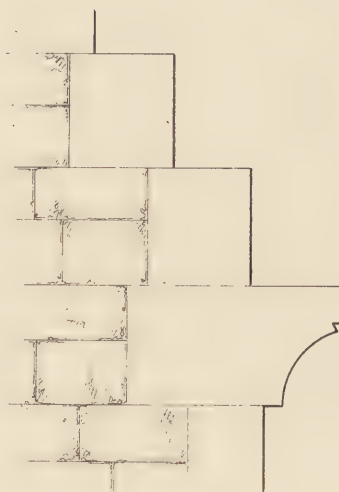
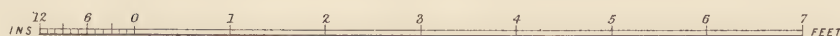PANEL IN FRONT GABLE

CHIMNEY PIECE

SECTION THROUGH PANEL

SECTION THROUGH JAMB

SPUR STONES OF GABLE

PLATES $\frac{O}{1}$ — $\frac{O}{2}$.

DESIGN FOR AN OLD SCOTCH LODGE.

PLATES $\frac{O}{1}$ — $\frac{O}{2}$ contain a design for a Lodge in the Old Scotch style, suitable for the entrance to a gentleman's park, or for a bailiff's residence on an estate.

It is of an inexpensive nature, being very simple in its parts, and plain in its details. The circular tower, which forms the porch, is the only feature of any importance in the design, and it is just sufficient to give a character to the building. It is finished with a slightly enriched cornice, and the high pointed roof which forms a marked feature in Old Scotch architecture. This roof may be covered in a uniform manner with square, rounded, or pointed slates, or in bands with slates of different shapes and colours, as shewn on Plate $\frac{M}{7}$. If the latter mode be adopted, the general roofs should be covered to match.

The windows may either be glazed with sheet or ornamental leaded glass.

The drawings shew the Lodge to be built of stone, which is the most suitable material for the style; but a good and rich effect would be obtained by adopting red brick for the walls, finishing the windows, doors, panels, crow-steps, cornices, chimneys, and base-course in light-coloured stone.

Over the entrance doorway in the tower is placed a square, sunk, and moulded panel for the reception of the arms or monogram of the proprietor.

The Design is illustrated by a Front Elevation, Ground Plan, Bedroom Plan, and Section, drawn to the scale of 1 inch to 10 feet.

GROUND FLOOR.—On the Ground Floor there are two parlours, the principal one of which measures 16 feet by 14 feet, exclusive of bay window, which is 7 feet 6 inches by 4 feet. The second parlour measures 14 feet by 13 feet. The doors of both these rooms open from the best part of the lobby. The lobby is six feet wide, and opens from the circular porch in the tower.

The kitchen, placed towards the back, is entered by a door situated in the rear of the lobby; it measures 14 feet by 12 feet 6 inches, and has a convenient
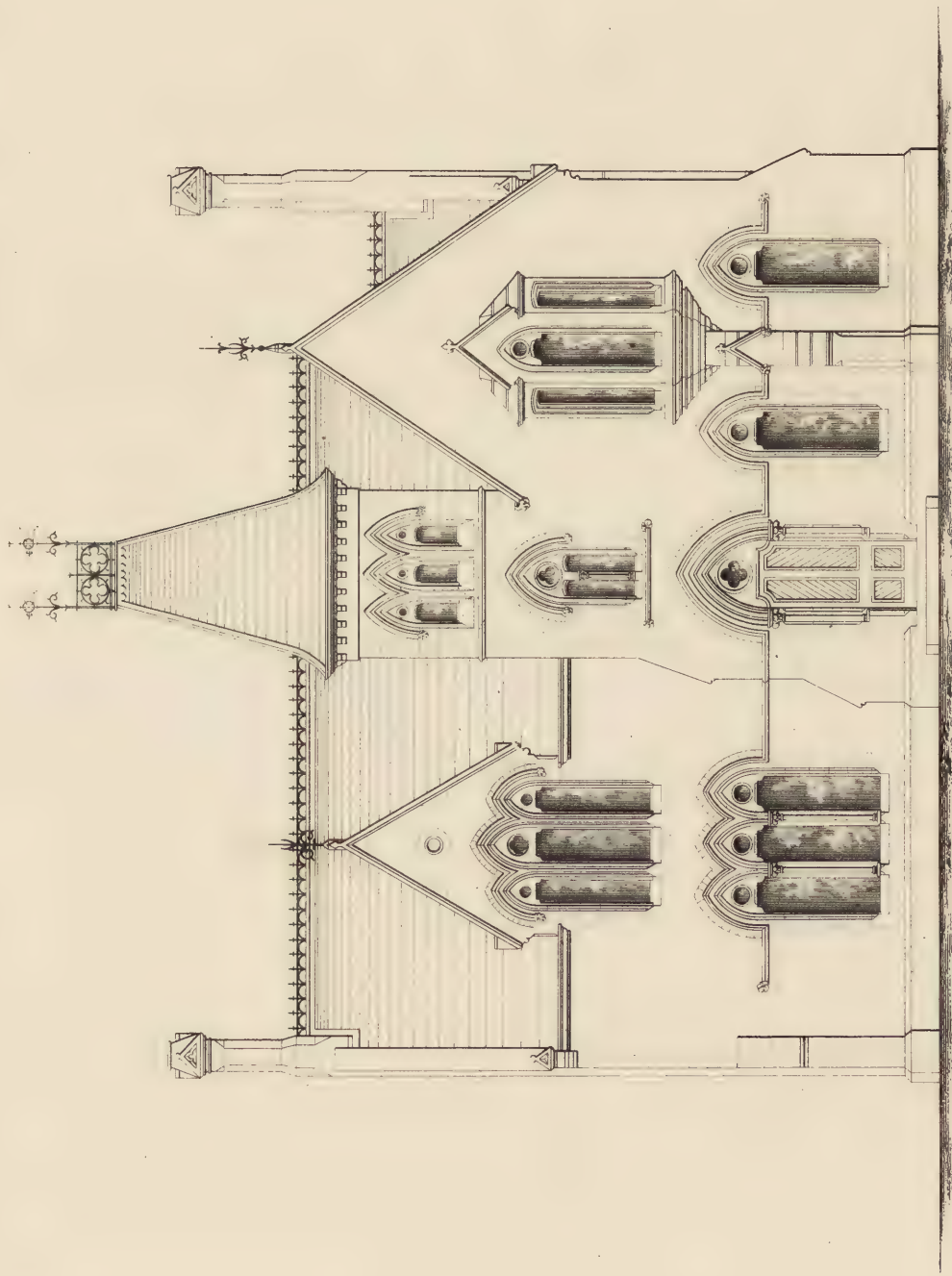
scullery and pantry attached.   The scullery is furnished with a sink-stone and small boiler.

The outbuildings comprise a coal-house, ash-pit, and privy.

BEDROOM FLOOR.—On the Bedroom Floor there are three good rooms, which are of the same size as the apartments underneath them on the Ground Floor.

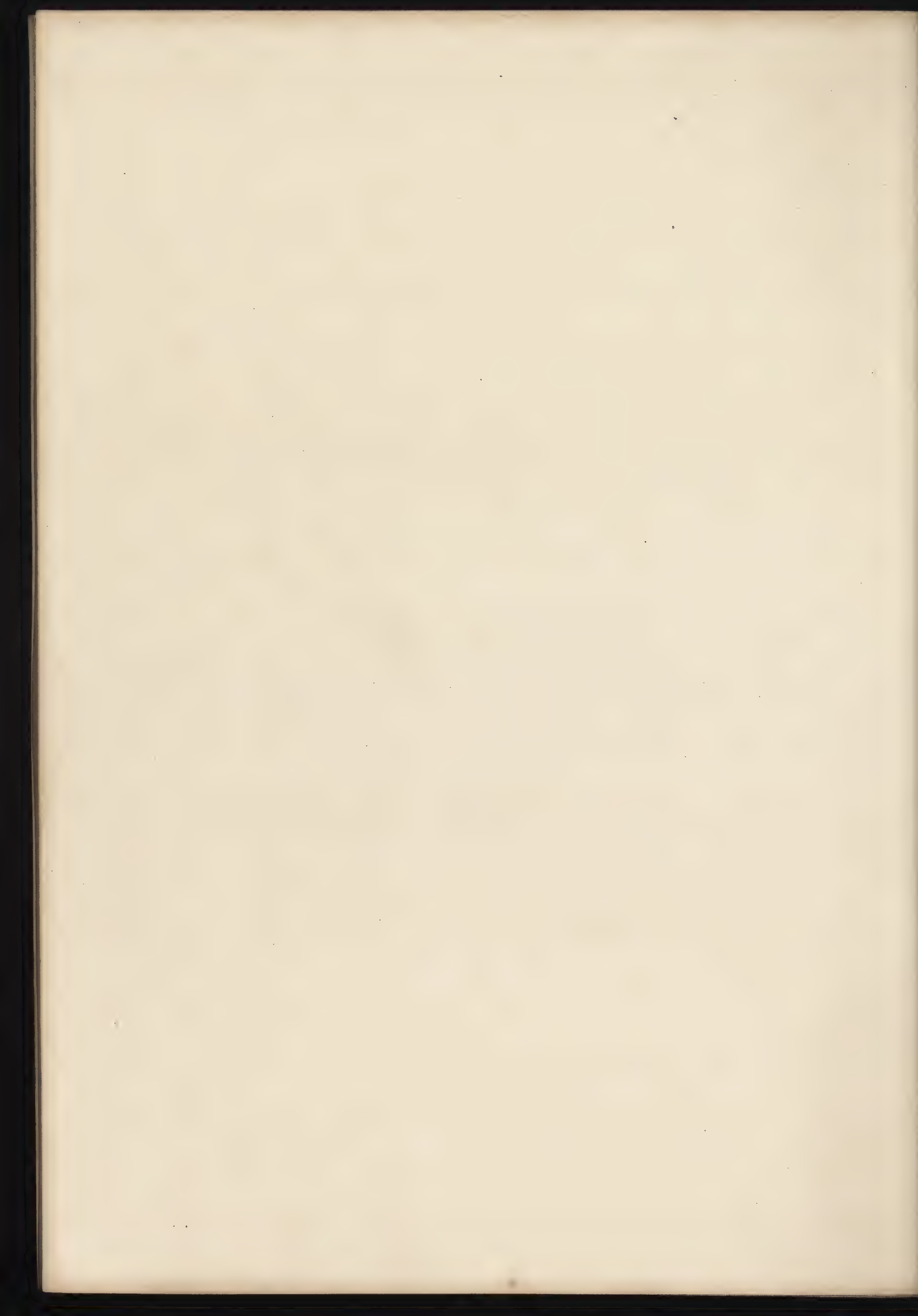There is also a closet in the tower, which may be used for many things.

The Section cuts the two parlours and the lobby between them, and the two front bedrooms above, on the line A—B shewn on the plans.
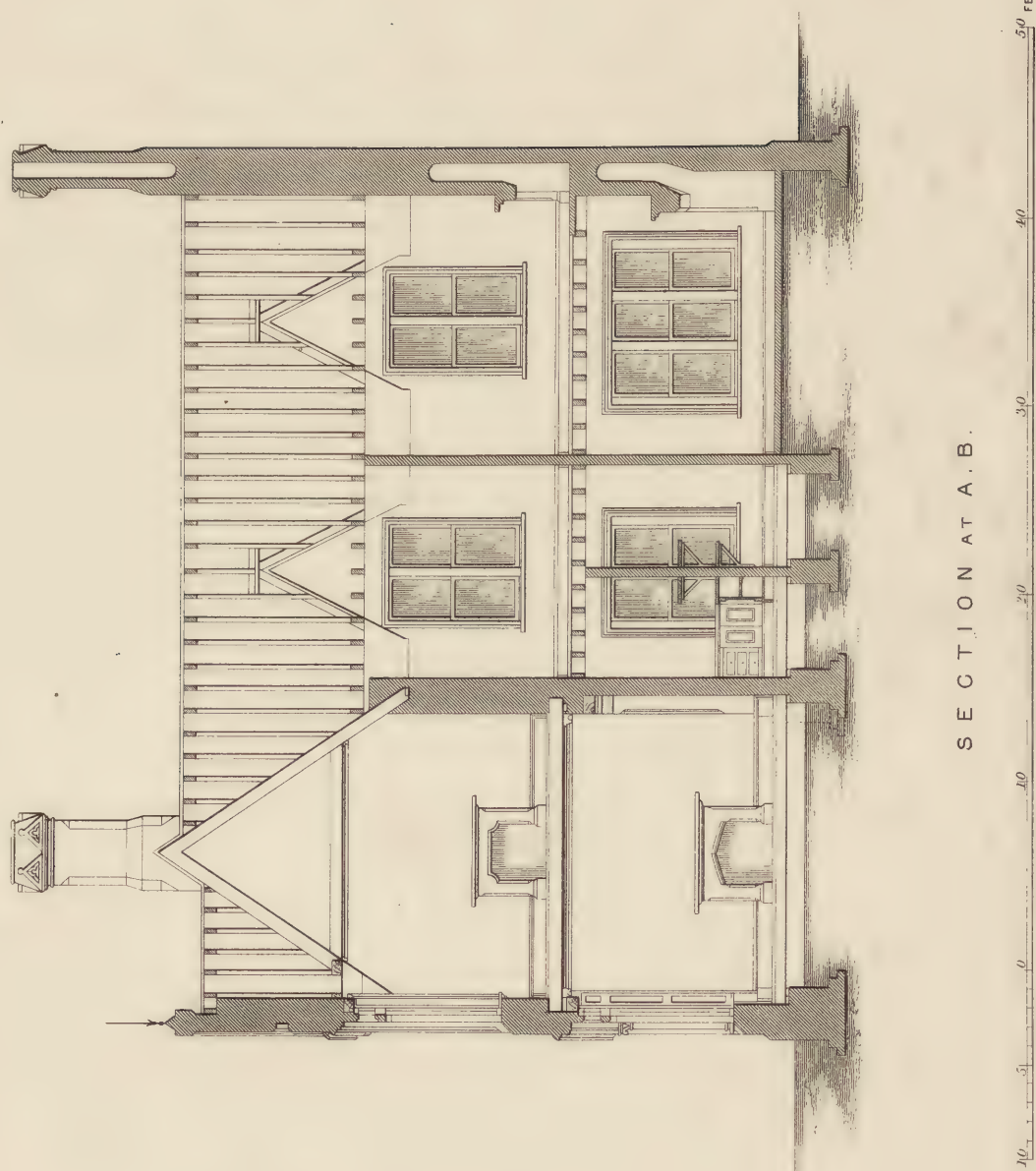
ELEVATION

50 FEET

SECTION AT A.B.

KITCHEN
14' 0" × 14' 0"

SCULLERY
11' 0" × 16' 0"

PRIVY

ASHES

SINK

PANTRY
9' 6" × 5' 6"

COALS

COURT

BUTLERS
PANTRY

PANTRY

STAIRCASE

DINING ROOM
20' 6" × 15' 0"

DRAWING ROOM
21' 6" × 15' 0"

PORCH
6' 0" × 6' 0"

A

B

GROUND PLAN

40   5   0   40   20   30   40 FEET

BEDROOM
14'-0" x 14'-0"

BEDROOM
11'-6" x 9'-6"

BEDROOM
20'-6" x 15'-0"

LANDING

BEDROOM
21'-6" x 15'-0"

W.C.

BEDROOM PLAN

10 5 0 10 20 30 40 FEET

CORNICE of TOWER   EAVE CORNICE

JAMB at G·H

ARCH at E·F.

NG ROOM WINDOWS

KITCHEN WINDOWS

FACE of CLUB

A

B

C   D
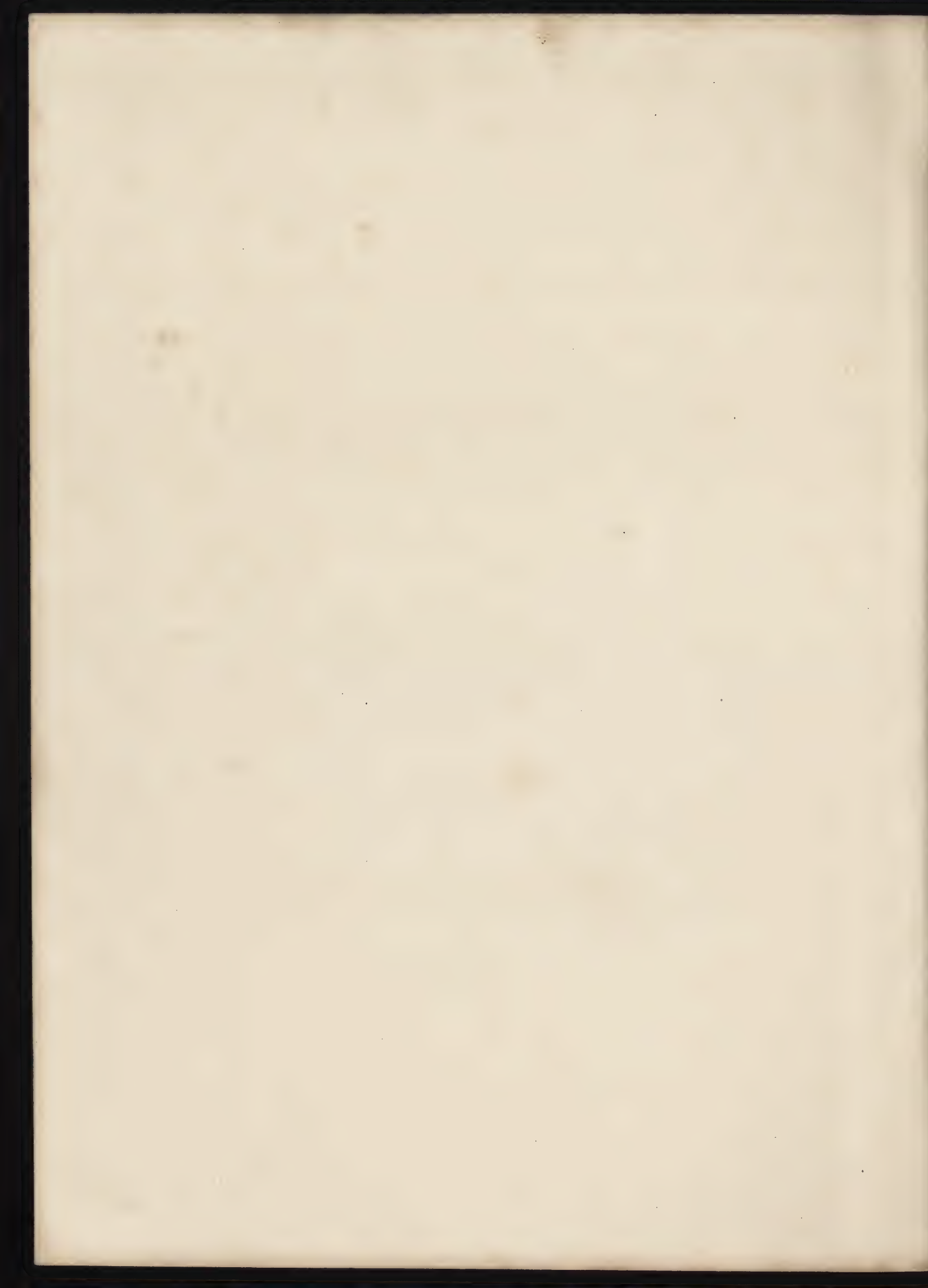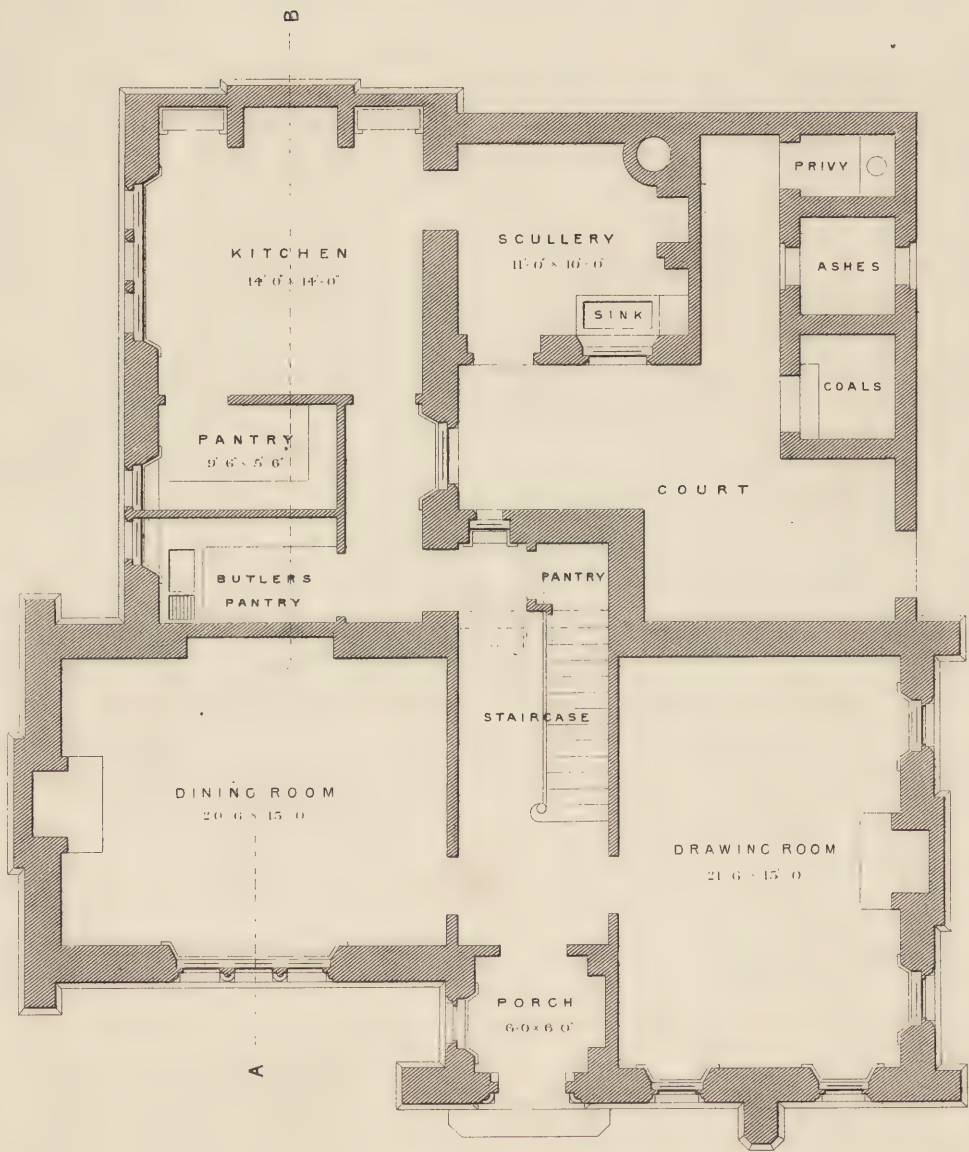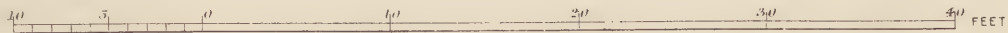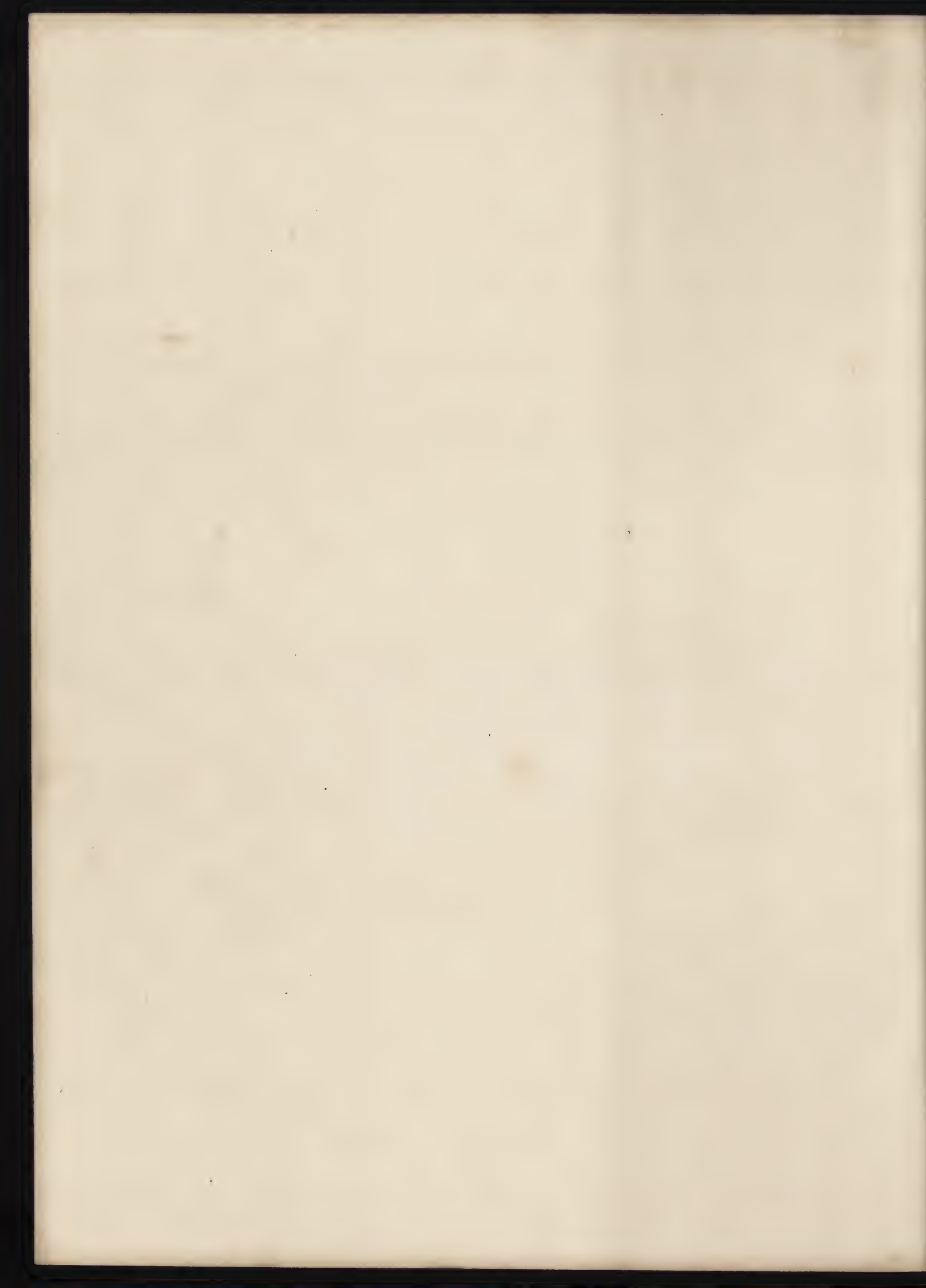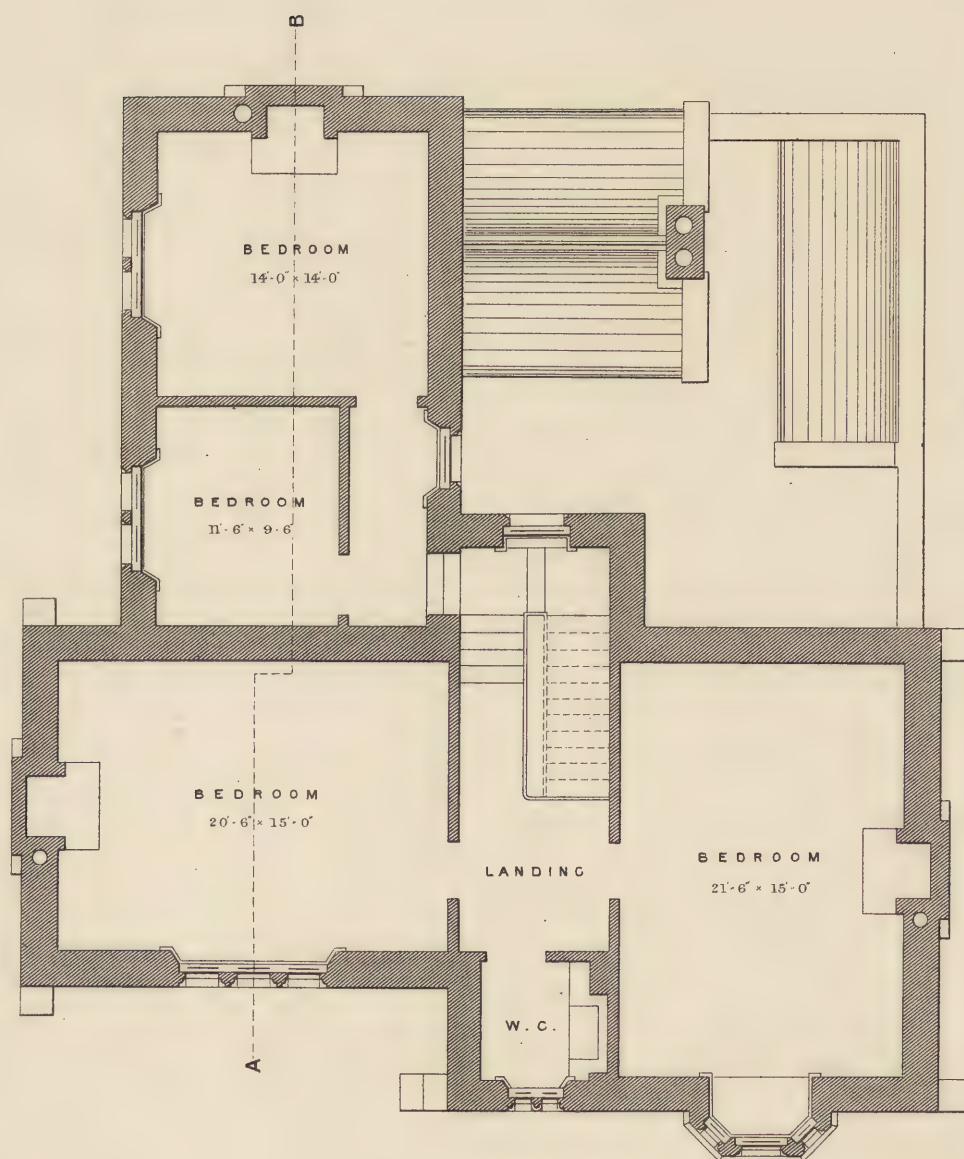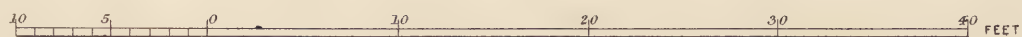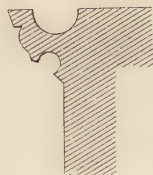
NEY STACKS
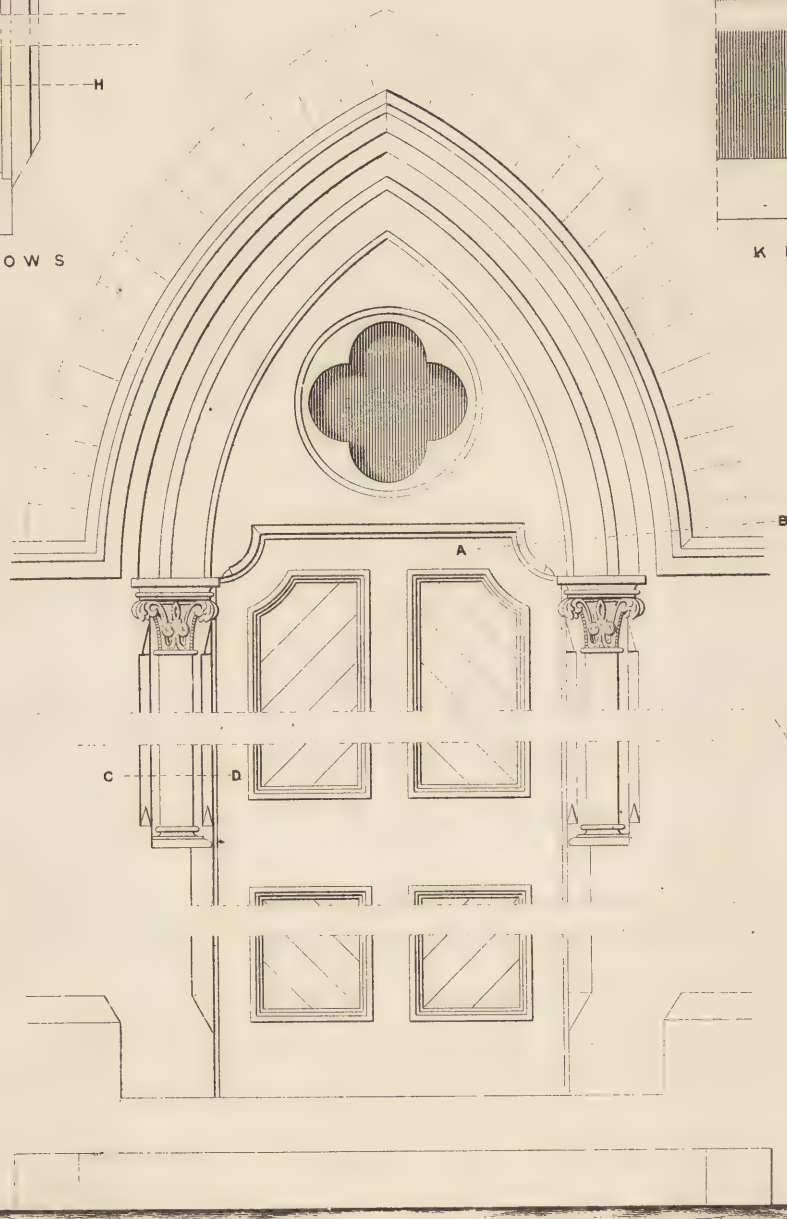
FRONT DOOR
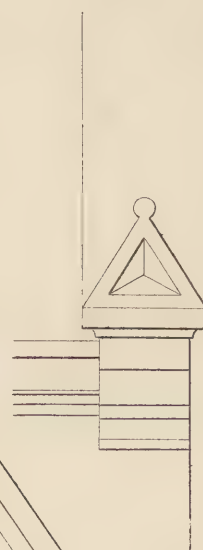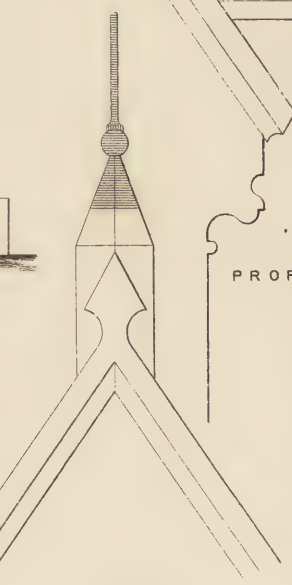
PROFILE of CLUB

JAMB at C·D.

ARCH at A·B.

CABLE TERMINALS

Shewing base of Iron Finials

DETAILS ½ INCH to the FOOT

EL UNDER ORIEL

PLATES $\frac{P}{1}$ — $\frac{P}{5}$.

DESIGN FOR A VILLA IN THE GOTHIC STYLE.

PLATES $\frac{P}{1}$ — $\frac{P}{5}$ contain Ground Plan, Bedroom Plan, Front Elevation, Section, and Details of a small villa designed in the early Gothic Style, or rather the modification of that style of architecture now most commonly adopted in England for domestic buildings.

The advantage gained by the modern treatment of the style, mainly exists in the more convenient shape of its windows. The objectionable and expensive cusped heads are done away with, and at the same time the beautiful lancet arch is introduced, and becomes a highly ornamental feature on the exterior. By filling in the arches, from their springing, with flat, panelled, or simply pierced stone-work, square or slightly shaped heads are obtained, which admit of the ordinary and desirable square finishings being used in the interior of the rooms. This will readily be seen by examining the detail of the kitchen window on Plate $\frac{P}{5}$, and the interior finishing of the same window in the Section, Plate $\frac{P}{2}$.

When the heads are pierced through and glazed, as is the case with the front windows and the two side ones of the drawing-room, the interior finishings are carried above the piercings and formed square as before. This is shewn in the windows cut in the left wall of the Section. The lower openings should be glazed with plate glass, while the piercings may appropriately be filled in with stained medallions.

The Design is shewn to be built of stone throughout; the quoins and finishings being dressed, and the walls executed in small rough-faced stones of a darker colour than the dressed work, or of parpoint rubble. Red brick, with stone finishings, would have a warm and good effect.

The tower, along with the general roofs, may be slated with plain or ornamental slates, and crested with open ironwork, as shewn, painted and gilded. All the gables which do not bear chimneys should be terminated with rich ironwork finials, also painted and gilded.

DESIGN FOR A VILLA IN THE GOTHIC STYLE.

All the details throughout the Design are of an effective and inexpensive character.

PLATES $\frac{P}{3}$ — $\frac{P}{4}$.—GROUND PLAN.—On the Ground Floor there is an entrance porch, measuring 6 feet by 6 feet, lighted by a side window and the pierced quatrefoil in the tympanum of the doorway. This porch communicates with the lobby, which is 8 feet wide.

The dining-room opens from the left of the lobby, and measures 20 feet 6 inches by 15 feet. In this Design the dining-room is intended to serve as a general living-room.

The drawing-room opens from the opposite side of the lobby, and measures 21 feet 6 inches by 15 feet. It is lighted by four single windows, which will give a cheerful aspect to the apartment.

A door in the rear of the lobby opens into the passage which communicates with the kitchen. Opposite this door is placed the butler's pantry, conveniently fitted up with a sink, drainer, and shelves. The kitchen measures 14 feet by 14 feet, and is supplied with two convenient cupboards, and a pantry, measuring 9 feet 6 inches by 5 feet 6 inches, furnished with shelves. A scullery, measuring 11 feet by 10 feet, is attached to the kitchen, and is fitted with a boiler and sink-stone.

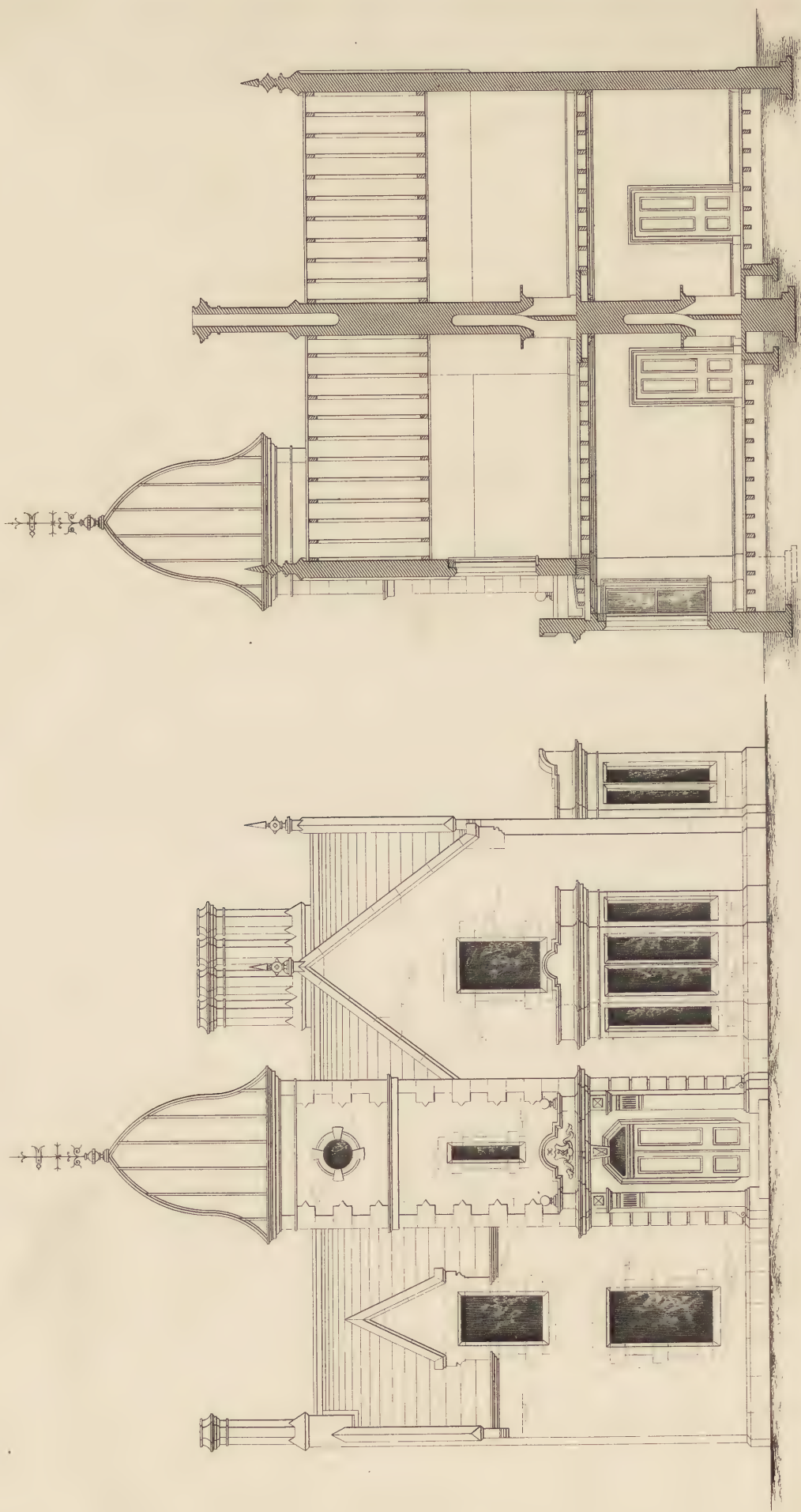A coal-house, ash-pit, and privy are supplied in an out-building in the court.

The height of the Ground Floor is 11 feet 3 inches, except kitchen wing, which is 10 feet.

BEDROOM PLAN.—On the Bedroom Floor there are four good rooms, measuring respectively 21 feet 6 inches by 15 feet; 20 feet 6 inches by 15 feet; 14 feet by 14 feet; and 11 feet 6 inches by 9 feet 6 inches. The bedroom over the drawing-room is lighted by an oriel window. A water-closet is supplied over the entrance porch.

The height of the Bedroom Floor is 11 feet.

PLATES $\frac{P}{1}$ — $\frac{P}{2}$ shew Front Elevation and Section. The latter is cut through the dining-room, butler's pantry, kitchen pantry, and kitchen and the bedrooms over, as shewn by the line A—B on the plans.

PLATE $\frac{P}{5}$ contains the details for the entrance doorway in tower, drawing-room windows, kitchen windows, chimney stalks, gable terminals and clubs, corbel of oriel, tower cornice and eave cornice, drawn to the scale of $\frac{1}{2}$ inch to 1 foot.

SECTION AT A.B.

30 FEET

ELEVATION

scullery and pantry attached. The scullery is furnished with a sink-stone and small boiler.

The outbuildings comprise a coal-house, ash-pit, and privy.

BEDROOM FLOOR.—On the Bedroom Floor there are three good rooms, which are of the same size as the apartments underneath them on the Ground Floor.

There is also a closet in the tower, which may be used for many things.

The Section cuts the two parlours and the lobby between them, and the two front bedrooms above, on the line A—B shewn on the plans.

GOTHIC VILLA

ELEVATION

50 FEET

GOTHIC VILLA

SECTION at A.B.

50 FEET

B

KITCHEN
14'·0"× 14'·0"

SCULLERY
11'·0"× 16'·6"

PRIVY

ASHES

SINK

COALS

PANTRY
9'·6"× 5'·6"

COURT

BUTLERS
PANTRY

PANTRY

STAIRCASE

DINING ROOM
20·6× 15·0

DRAWING ROOM
21·6 × 15·0

A

PORCH
6·0× 6·0

GROUND PLAN

10   5   0   10   20   30   40 FEET

B

BEDROOM
14'-0" x 14'-0"

BEDROOM
11'-6" x 9'-6"

BEDROOM
20'-6" x 15'-0"

LANDING

BEDROOM
21'-6" x 15'-0"

W. C.

A

BEDROOM PLAN

10   5   0   10   20   30   40 FEET

KITCHEN
14'·0' × 14'·0"

SCULLERY
11'·6' × 10'·6'

PRIVY

ASHES

SINK

COALS

PANTRY
9'·6' × 5'·6'

COURT

BUTLERS
PANTRY

PANTRY

STAIRCASE

DINING ROOM
20'·6' × 15'·0'

DRAWING ROOM
21'·6' × 15'·0'

PORCH
6'·0' × 6'·0'

A

GROUND PLAN

10   5   0   10   20   30   40 FEET

B

KITCHEN
14' 0' x 14' 0'

SCULLERY
11' 0' x 10' 0'

PRIVY

ASHES

SINK

COALS

PANTRY
9' 6' x 5' 6'

COURT

BUTLERS
PANTRY

PANTRY

STAIRCASE

DINING ROOM
20' 6' x 15' 0'

DRAWING ROOM
21' 6' x 15' 0'

A

PORCH
6' 0' x 6' 0'

GROUND PLAN

40   5   0   10   20   30   40   FEET

B

BEDROOM
14·0" × 14·0"

BEDROOM
11'·6" × 9'·6"

BEDROOM
20'·6" × 15'·0"

BEDROOM
21'·6" × 15'·0"

LANDING

W.C.

A

BEDROOM PLAN

10 5 0 10 20 30 40 FEET

CORNICE of TOWER   EAVE CORNICE

JAMB at G-H   ARCH at E-F.

...WING ROOM WINDOWS

KITCHEN WINDOWS

FACE of CLUB

PROFILE of CLUB

...MNEY STACKS

FRONT DOOR

JAMB at C-D.   ARCH at A.B.

CABLE TERMINALS

Shewing base of Iron Finials

DETAILS ½ INCH to the FOOT

...BEL UNDER ORIEL

PLATES $\frac{P}{1}$ —— $\frac{P}{5}$.

DESIGN FOR A VILLA IN THE GOTHIC STYLE.

PLATES $\frac{P}{1}$ — $\frac{P}{5}$ contain Ground Plan, Bedroom Plan, Front Elevation, Section, and Details of a small villa designed in the early Gothic Style, or rather the modification of that style of architecture now most commonly adopted in England for domestic buildings.

The advantage gained by the modern treatment of the style, mainly exists in the more convenient shape of its windows. The objectionable and expensive cusped heads are done away with, and at the same time the beautiful lancet arch is introduced, and becomes a highly ornamental feature on the exterior. By filling in the arches, from their springing, with flat, panelled, or simply pierced stone-work, square or slightly shaped heads are obtained, which admit of the ordinary and desirable square finishings being used in the interior of the rooms. This will readily be seen by examining the detail of the kitchen window on Plate $\frac{P}{5}$, and the interior finishing of the same window in the Section, Plate $\frac{P}{2}$.

When the heads are pierced through and glazed, as is the case with the front windows and the two side ones of the drawing-room, the interior finishings are carried above the piercings and formed square as before. This is shewn in the windows cut in the left wall of the Section. The lower openings should be glazed with plate glass, while the piercings may appropriately be filled in with stained medallions.

The Design is shewn to be built of stone throughout; the quoins and finishings being dressed, and the walls executed in small rough-faced stones of a darker colour than the dressed work, or of parpoint rubble. Red brick, with stone finishings, would have a warm and good effect.

The tower, along with the general roofs, may be slated with plain or ornamental slates, and crested with open ironwork, as shewn, painted and gilded. All the gables which do not bear chimneys should be terminated with rich ironwork finials, also painted and gilded.

DESIGN FOR A VILLA IN THE GOTHIC STYLE.

All the details throughout the Design are of an effective and inexpensive character.

PLATES $\frac{P}{3}$ — $\frac{P}{4}$.—GROUND PLAN.—On the Ground Floor there is an entrance porch, measuring 6 feet by 6 feet, lighted by a side window and the pierced quatrefoil in the tympanum of the doorway. This porch communicates with the lobby, which is 8 feet wide.

The dining-room opens from the left of the lobby, and measures 20 feet 6 inches by 15 feet. In this Design the dining-room is intended to serve as a general living-room.

The drawing-room opens from the opposite side of the lobby, and measures 21 feet 6 inches by 15 feet. It is lighted by four single windows, which will give a cheerful aspect to the apartment.

A door in the rear of the lobby opens into the passage which communicates with the kitchen. Opposite this door is placed the butler's pantry, conveniently fitted up with a sink, drainer, and shelves. The kitchen measures 14 feet by 14 feet, and is supplied with two convenient cupboards, and a pantry, measuring 9 feet 6 inches by 5 feet 6 inches, furnished with shelves. A scullery, measuring 11 feet by 10 feet, is attached to the kitchen, and is fitted with a boiler and sink-stone.

A coal-house, ash-pit, and privy are supplied in an out-building in the court.

The height of the Ground Floor is 11 feet 3 inches, except kitchen wing, which is 10 feet.

BEDROOM PLAN.—On the Bedroom Floor there are four good rooms, measuring respectively 21 feet 6 inches by 15 feet; 20 feet 6 inches by 15 feet; 14 feet by 14 feet; and 11 feet 6 inches by 9 feet 6 inches. The bedroom over the drawing-room is lighted by an oriel window. A water-closet is supplied over the entrance porch.

The height of the Bedroom Floor is 11 feet.

PLATES $\frac{P}{1}$ — $\frac{P}{2}$ shew Front Elevation and Section. The latter is cut through the dining-room, butler's pantry, kitchen pantry, and kitchen and the bedrooms over, as shewn by the line A—B on the plans.

PLATE $\frac{P}{5}$ contains the details for the entrance doorway in tower, drawing-room windows, kitchen windows, chimney stalks, gable terminals and clubs, corbel of oriel, tower cornice and eave cornice, drawn to the scale of $\frac{1}{2}$ inch to 1 foot.

SECTION AT A. B.

ELEVATION

10   5   0   10   20   30   40   50 FEET

ELIZABETHAN LODGE

BEDROOM PLAN

B

BEDROOM
15 × 14

BEDROOM
15 × 15

LANDING

BATH
&
W.C.

BEDROOM
14·3 × 13·6

A

50 FEET

GROUND PLAN

B

PARLOR
15 × 14

PARLOR
15 × 15

PANTRY

PORCH

A

SCULLERY
8·6 × 8·0

KITCHEN
13·6 × 13·0

SINK

ASHES

COALS

10   5   0   10   20   30   40

WILLIAM MACKENZIE GLASGOW, EDINBURGH & LONDON

DETAILS

FRONT

SIDE

ENTRANCE DOORWAY
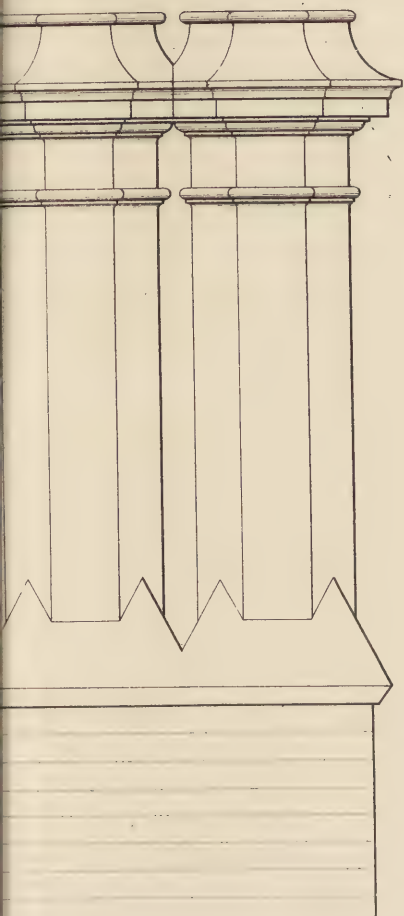
DETAILS
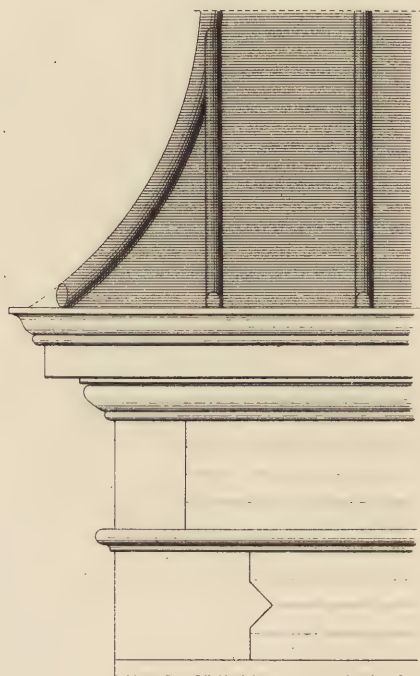
CORNICE OF TOWER

GABLE FINIAL

CHIMNEYS
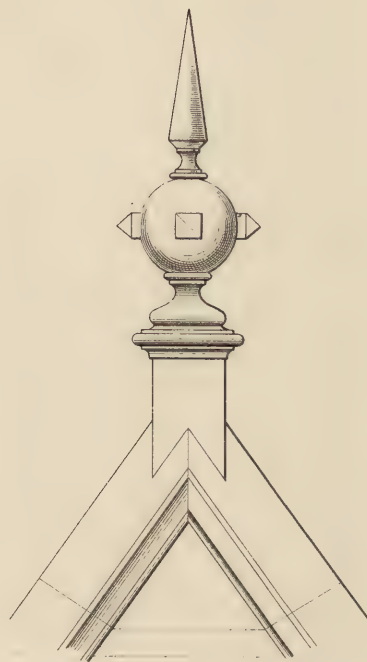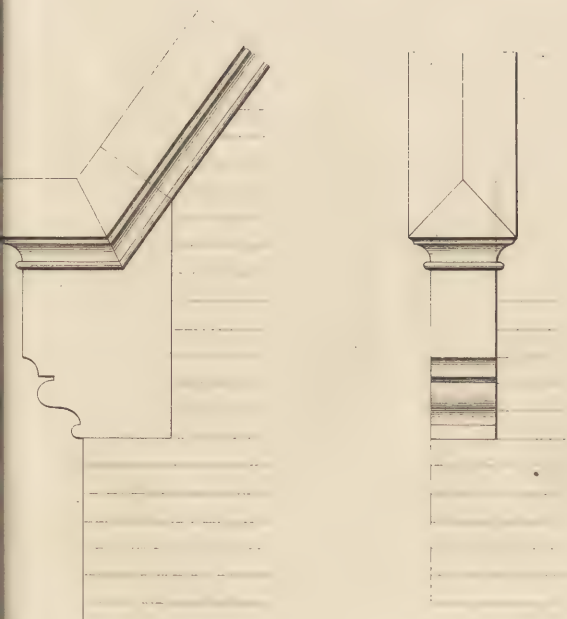
SIDE   FRONT

SPUR STONE

DORMER WINDOW

INS 12 6 0   1   2   3   4   5   6   7   8   9 FEET
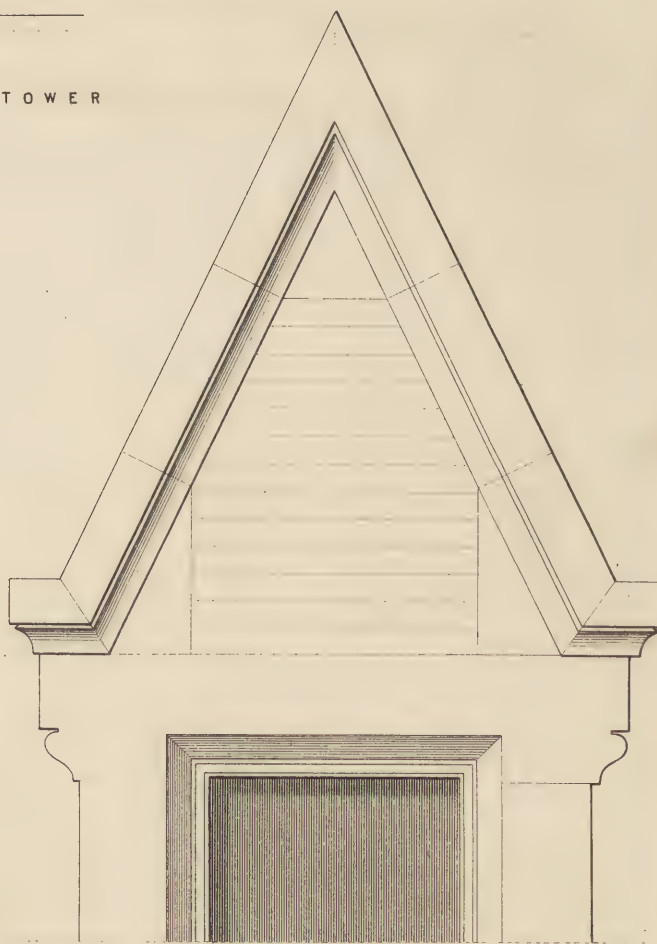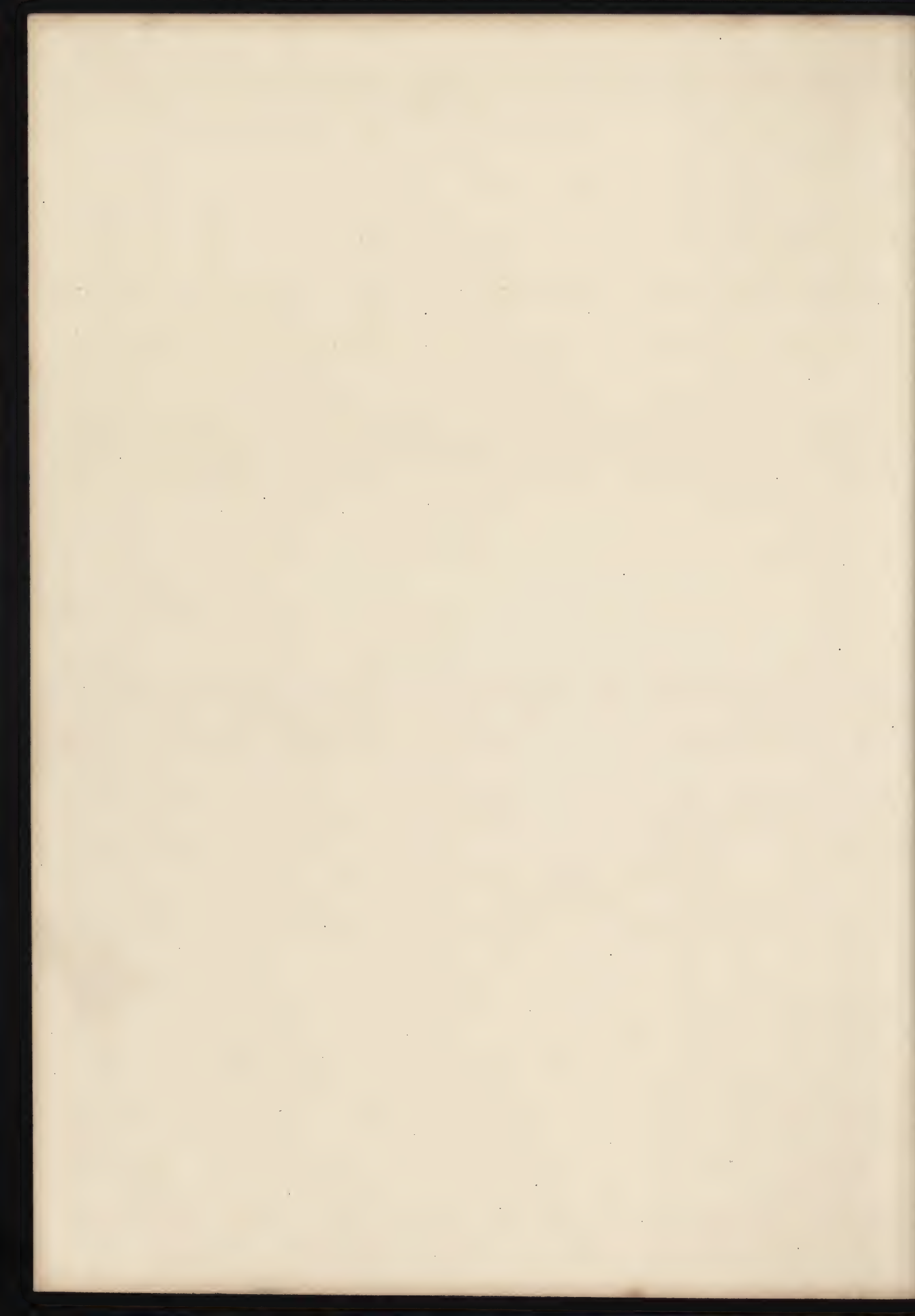
PLATES $\frac{R}{1}$ — $\frac{R}{2}$.

DESIGN FOR A LODGE IN THE ELIZABETHAN STYLE.

PLATES $\frac{R}{1}$ — $\frac{R}{2}$ contain a Design for an entrance Lodge in the Elizabethan style. It is not only suitable for a building of that class, but may be adopted for a private Cottage Residence, containing all the conveniences necessary for a small and comfortable dwelling.

Exteriorly it is of a slightly ornate character, having a tower in front, with ornamental doorway, angle quoins, &c., surmounted with the ogee-roof peculiar to Elizabethan architecture. The roof is to be covered with lead, and terminated by a wrought metal finial, as shewn.

The general roofs may be covered with plain or ornamental slates.

The drawings shew the Design to be executed in brick with stone finishings, except the doorway and lower portion of the tower, the projecting windows, and the chimneys, which are intended to be entirely of dressed stone.

The windows should be glazed with plate or sheet glass in large panes.

GROUND FLOOR.—On the Ground Floor there are two parlours, a kitchen, scullery, and convenient pantry.

The front parlour, opening off the best part of the lobby, measures 15 feet by 15 feet, exclusive of its two projecting windows. These windows, from their position in the room and being dissimilar in form, will give the parlour a light and elegant appearance. The room is supplied with two convenient presses placed near the fireplace.

The back parlour is a comfortable room, measuring 15 feet by 13 feet 6 inches. It has also two presses.

The kitchen opens from the back lobby, and measures 13 feet 6 inches by 13 feet. It has a large fireplace flanked by two convenient cupboards and sets of drawers. The scullery and pantry also open from the kitchen or back lobby. A coal-house and ash-pit are provided in an outbuilding.

DESIGN FOR A LODGE IN THE ELIZABETHAN STYLE.

The porch in the tower is 7 feet square; the front lobby is 7 feet wide, the staircase being 3 feet.

The height of the Ground Floor is 10 feet.

BEDROOM FLOOR.—On the Bedroom Floor there are three good bedrooms, measuring respectively 15 feet by 15 feet; 15 feet by 13 feet 6 inches; and 13 feet 6 inches by 13 feet; all having fireplaces and large windows.

In the tower is provided a bath-room furnished complete with shower and plunge baths, water-closet, and wash-stand.

The height of the Bedroom Floor is 10 feet.

The Section is drawn on the line A—B through the front and back parlours looking towards the tower, and through the two bedrooms situated over them.
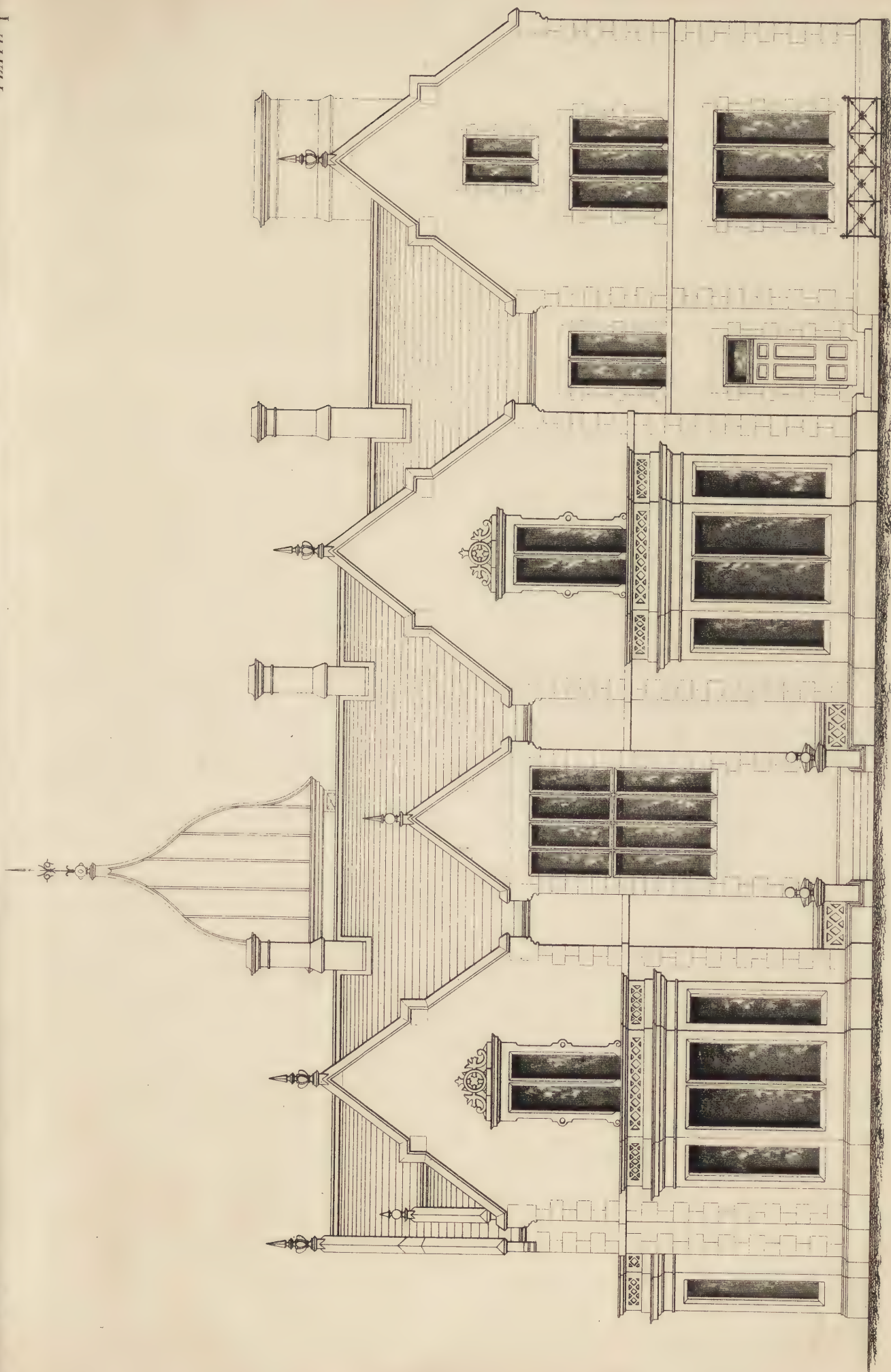
SOUTH ELEVATION
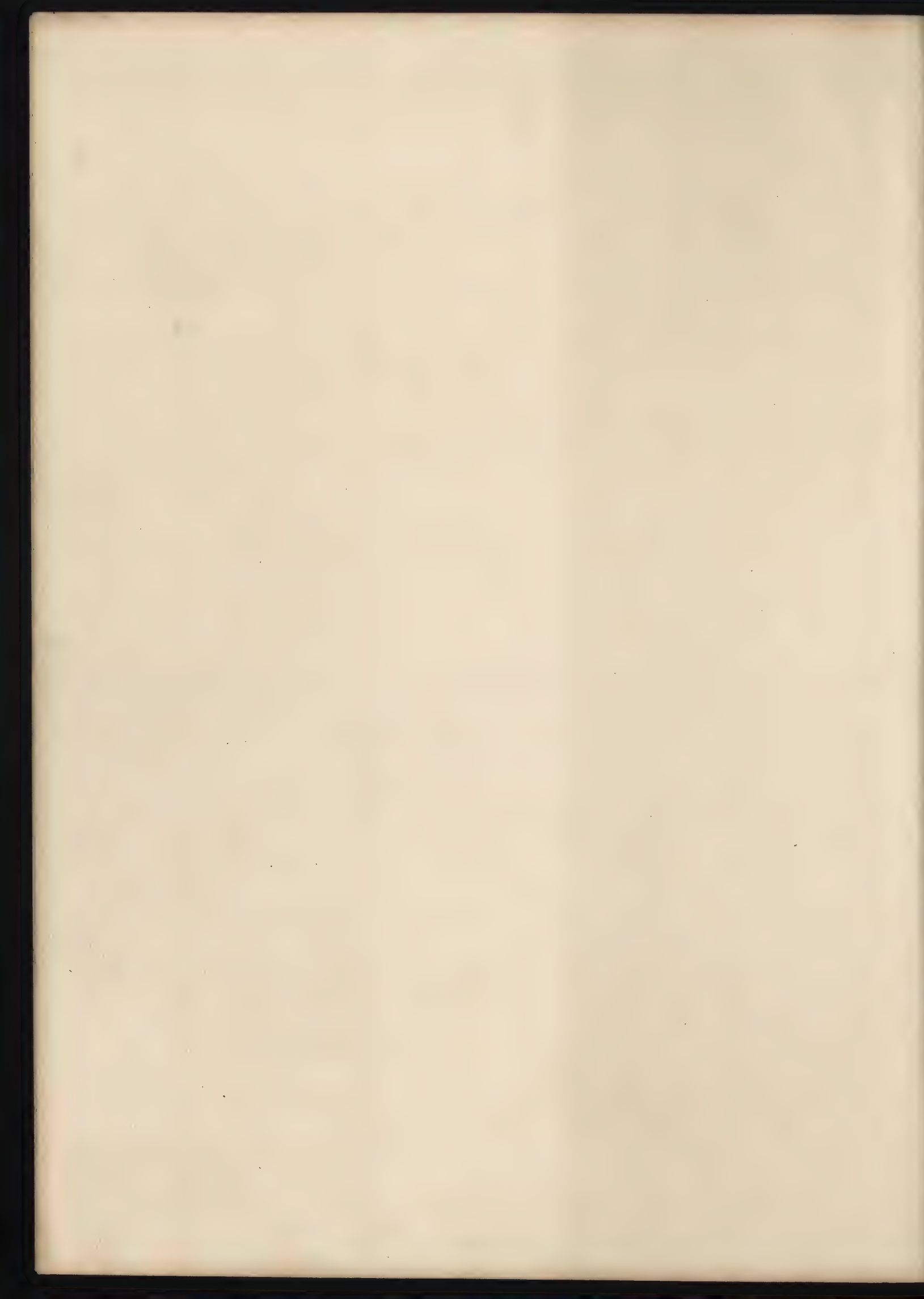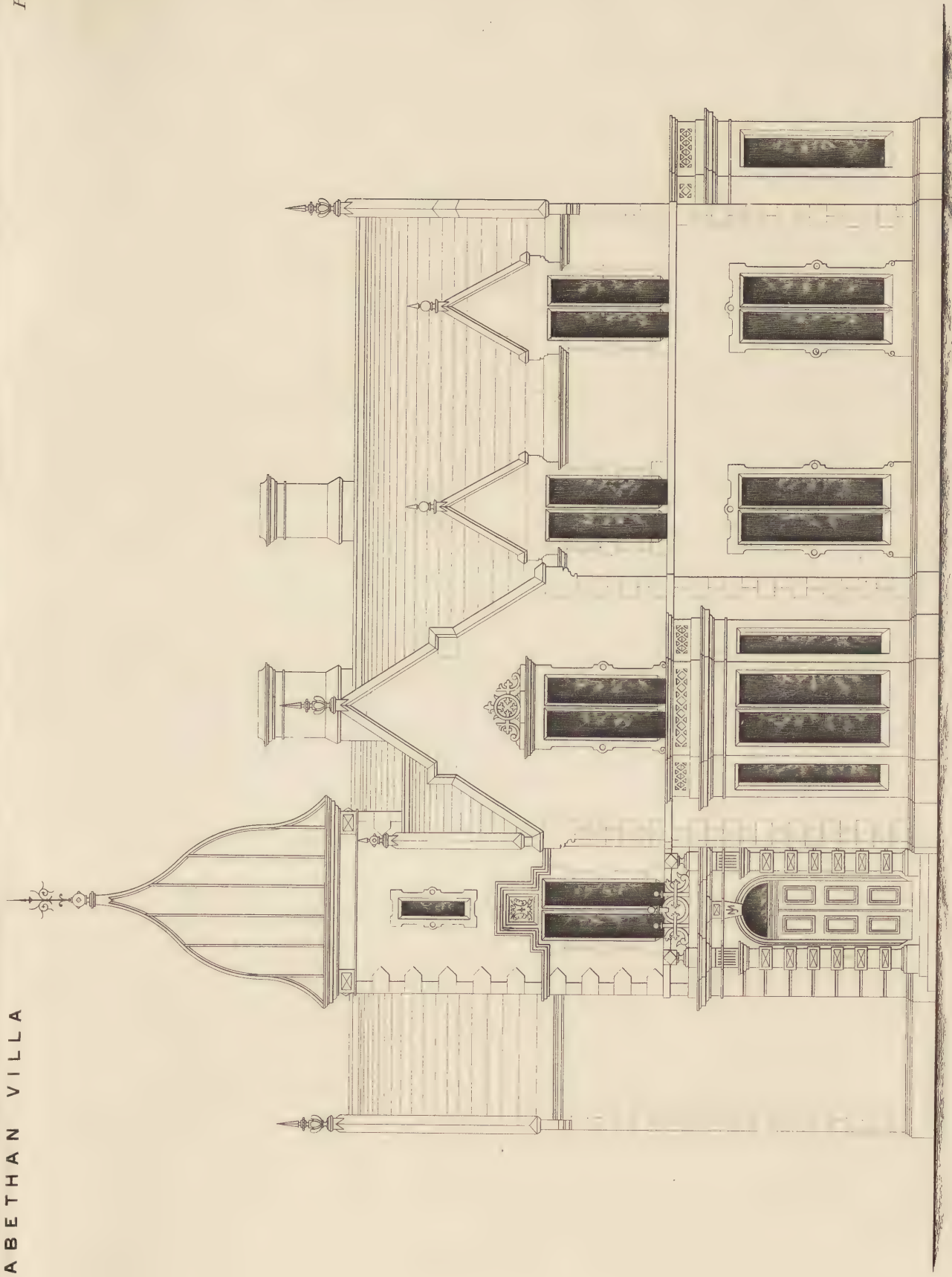
ELIZABETHAN VILLA

WEST ELEVATION

WILLIAM M MALKENZIE GLASGOW EDINBURGH & LONDON

10   5   0   10   20   30   40   50 FEET
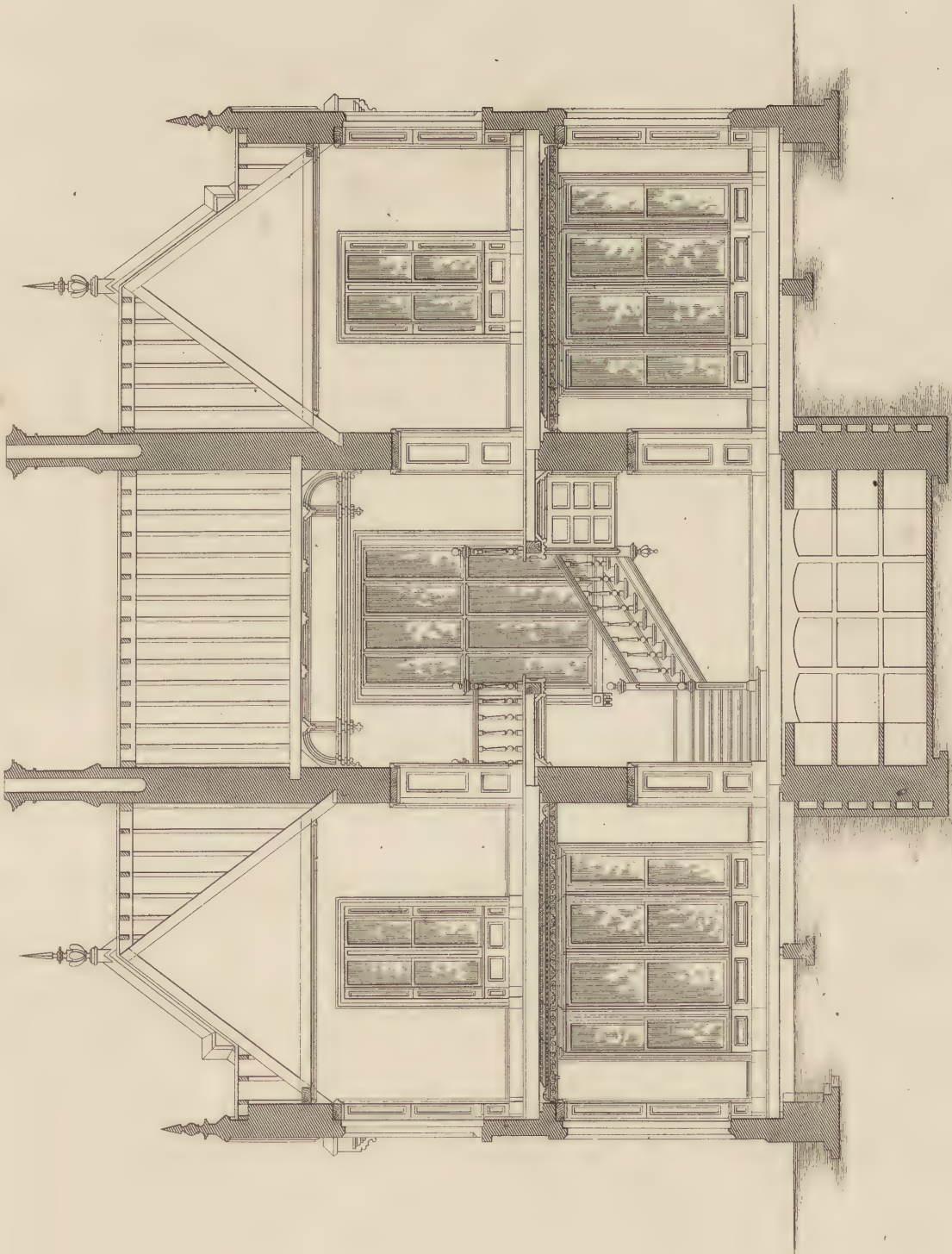
ELIZABETHAN VILLA

SECTION at A. B.
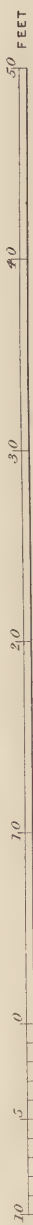
WILLIAM MACKENZIE, GLASGOW EDINBURGH & LONDON

ELIZABETHAN VILLA

PORCH
10' × 9'

VESTIBULE
11' × 9'

GENTLEMENS
ROOM
9' × 8' 6"

STORE
15·0' × 8·6'

BUTL
PANT
15·0' ×

CUPBOARDS

CUPBOARDS

Sink

PASSAGE

MORNING ROOM
20' × 15·0'

HALL

STAIRCASE
24·0' × 18·0'

B

DRAWING ROOM
25·0' × 17'·6"

Stove

DINING RO
26·0' × 18·0'

WILLIAM MACKEN

AREA

SCULLERY
18'·5" × 14'·0"

SINK STONE

PORCH

PANTRY

COALS
10'·6" × 7'·0"

PRIVY

COURT

ACK STAIR

KITCHEN
19'·6" × 18'·0"

STAIR TO WASH HOUSE &c.

ASHES
10'·0" × 7'·0"

WOOD &c
8'·9" × 7'·0"

AREA
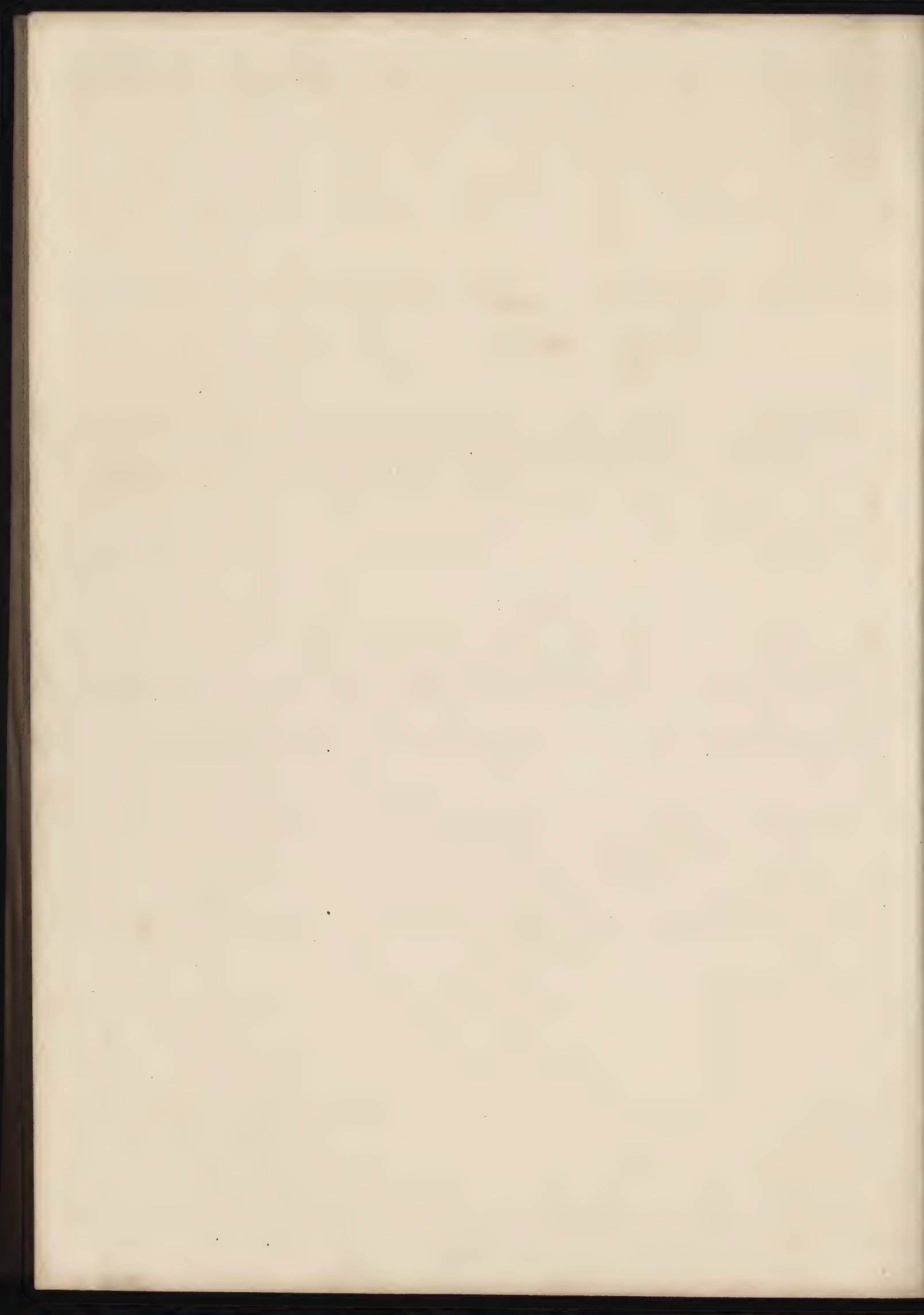
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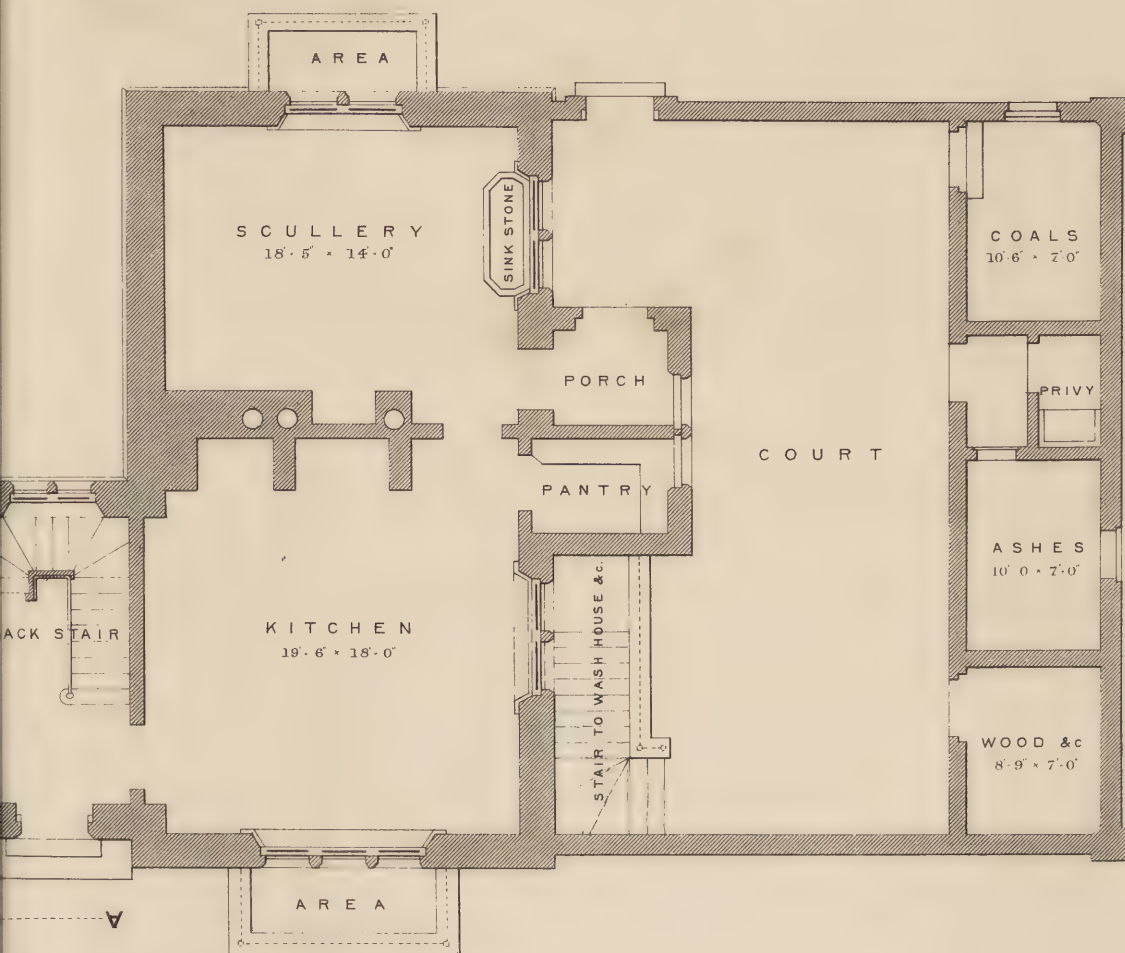
—— GROUND   PLAN ——

3,0   4,0   5,0 FEET

ELIZABETHAN VILLA

DRESSING
ROOM
20' × 9'

BATH ROOM
&
W. C.
10' × 9'

BED
18'-0"

BEDROOM
20' × 15'

GALLERY

PA

DR

B

BEDROOM
25'-9" × 17'-6"

BE

BEDROOM
18'·3" × 15'·0"

BEDROOM
15'·6" × 14'·0"

LANDING

HOUSE
MAID'S
CLOSET

CLOSET

A
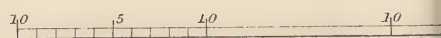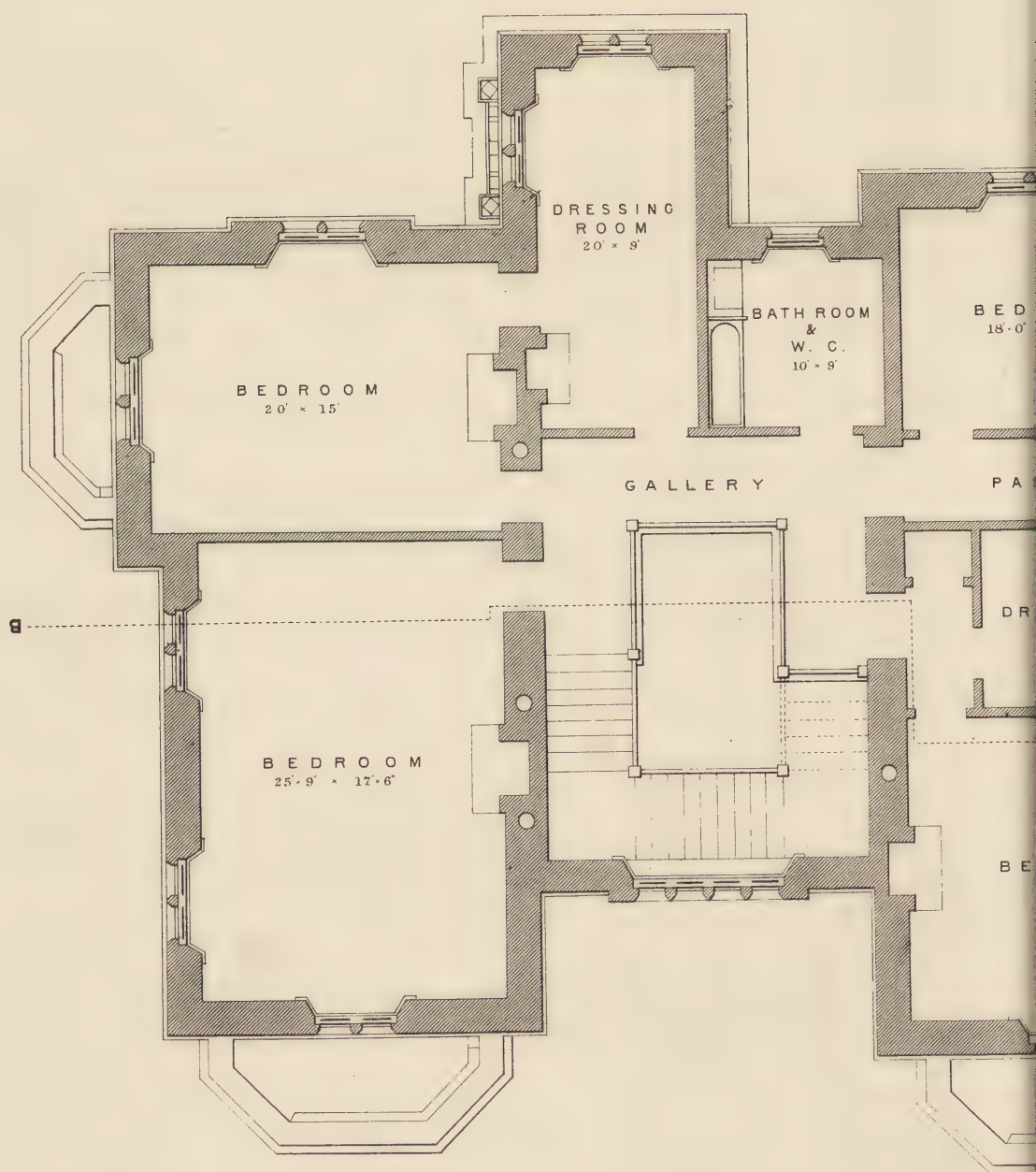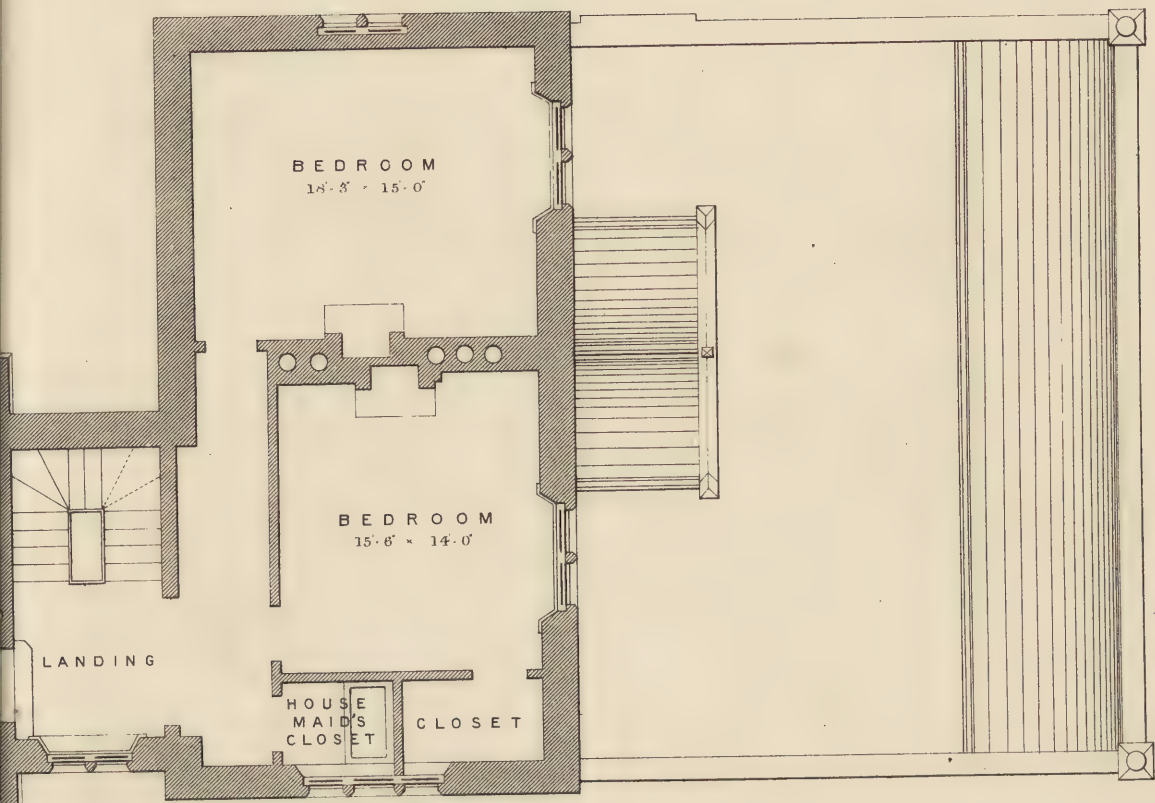
— BEDROOM PLAN —

3,0   4,0   5,0 FEET
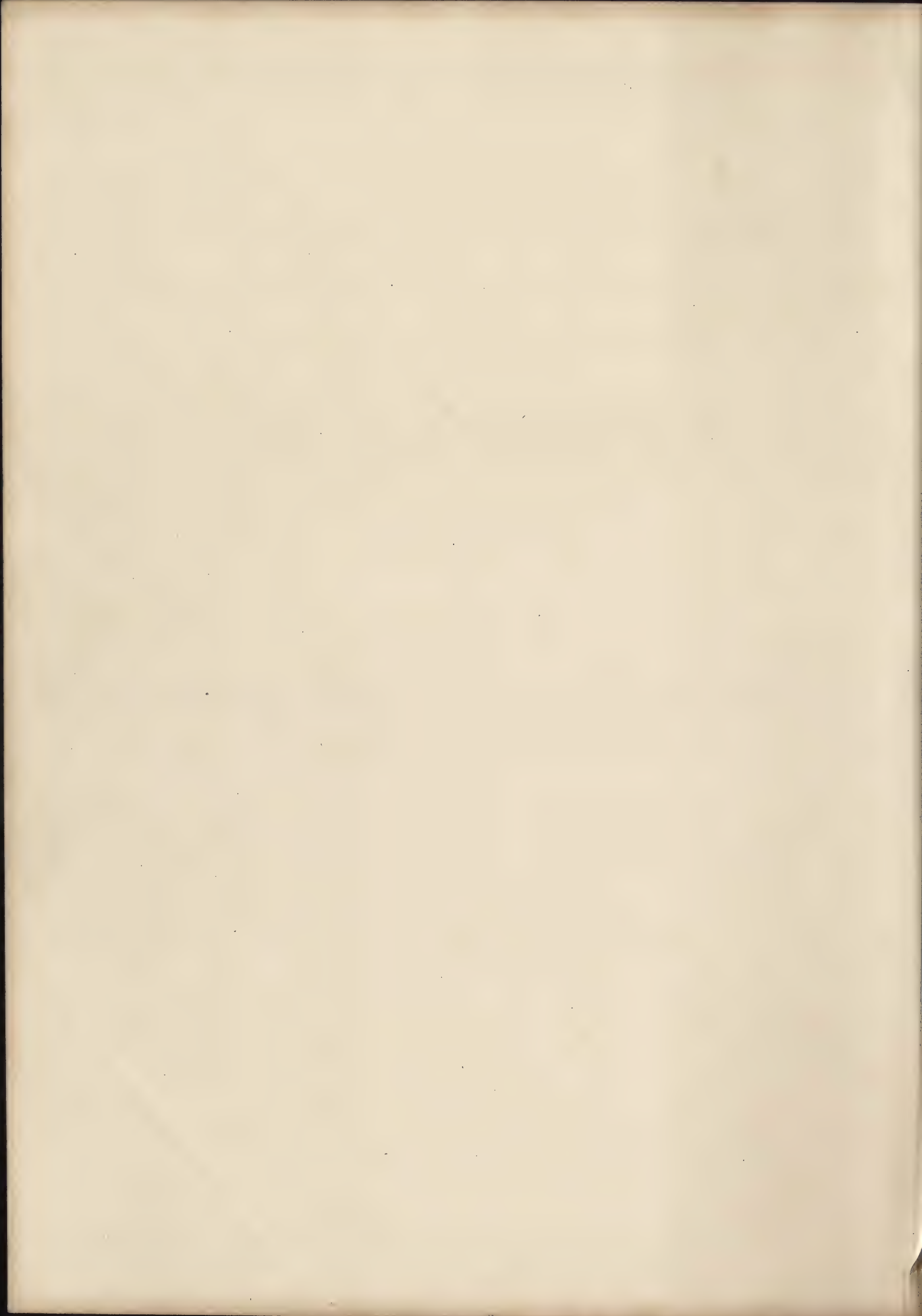
DETAILS
SCALE 3/4 THS INCH TO I FOOT

STRING OF TOWER

CORNICE OF
SIDE WALLS

MOULDING AT A.B.

CORNICE &c OF TOWER

A — — B
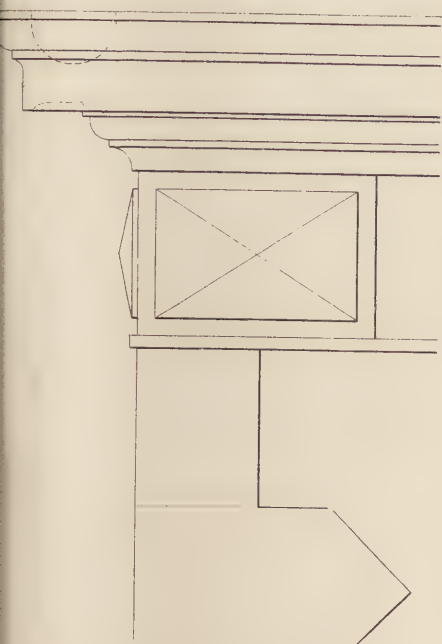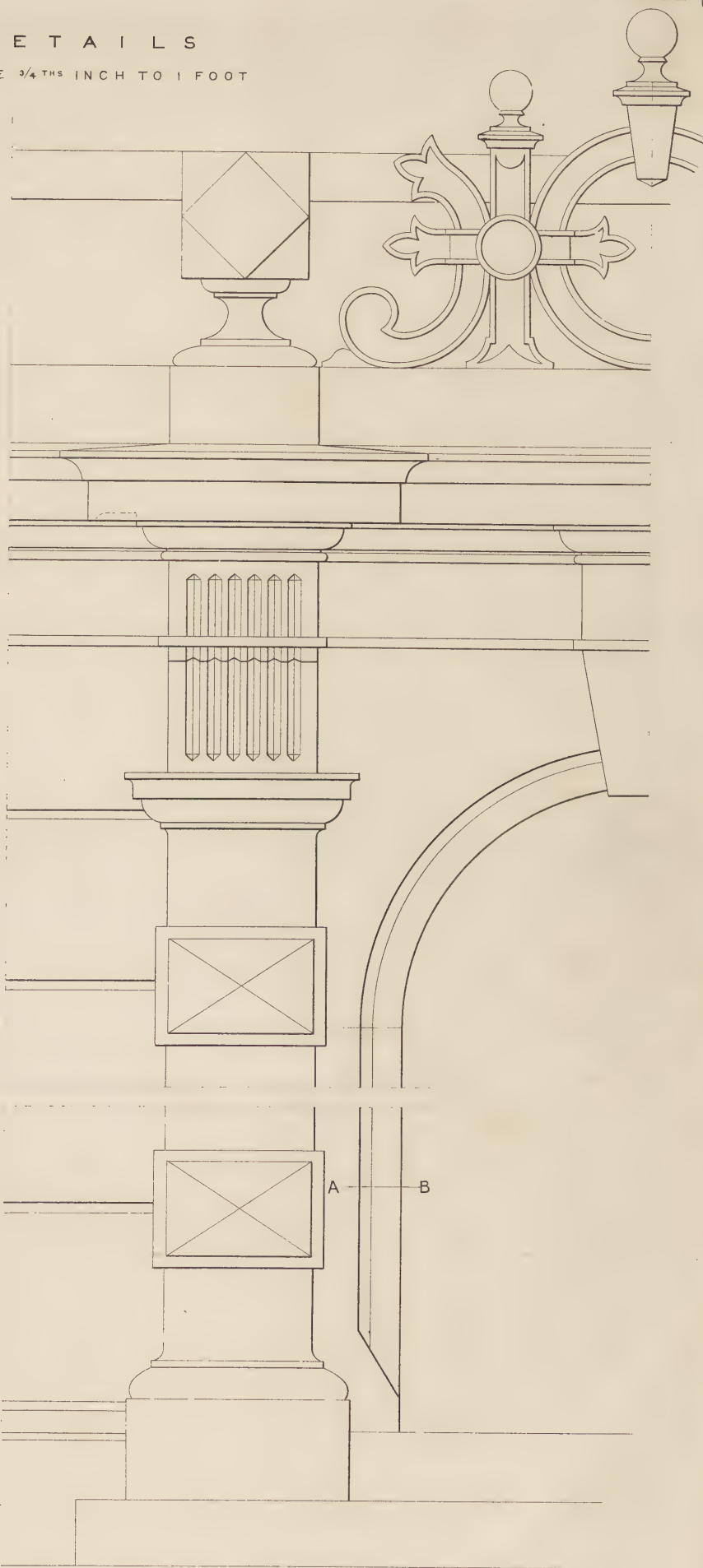
ENTRANCE DOORWAY

DETAILS

SCALE ¾THS INCH TO 1 FOOT
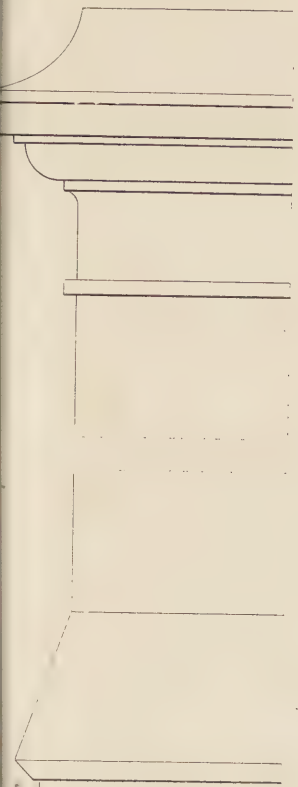
WINDOWS OVER BAYS

CHIMNEY HEADS
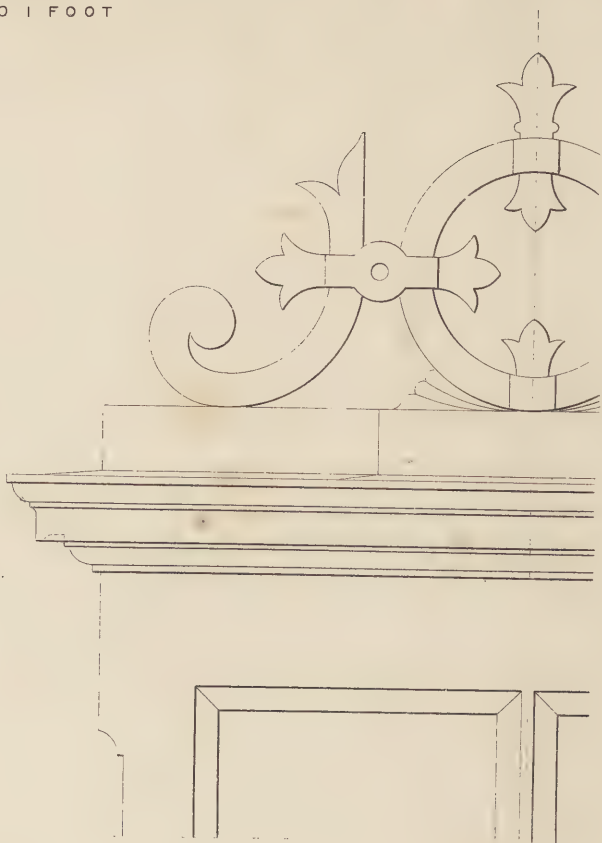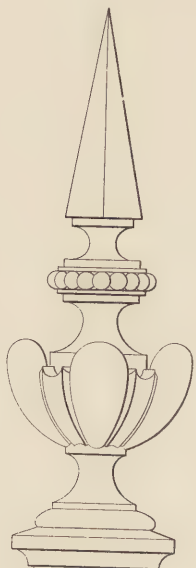
DETAILS
OF
MAIN GABLES
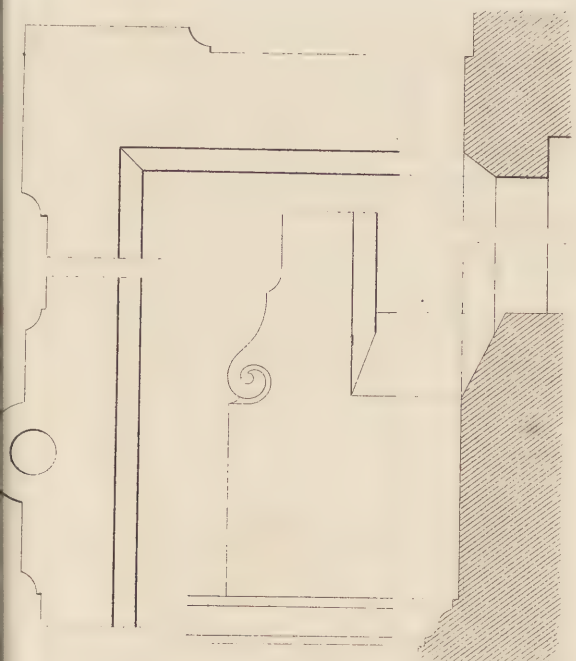
DETAILS OF LOWER WINDOWS
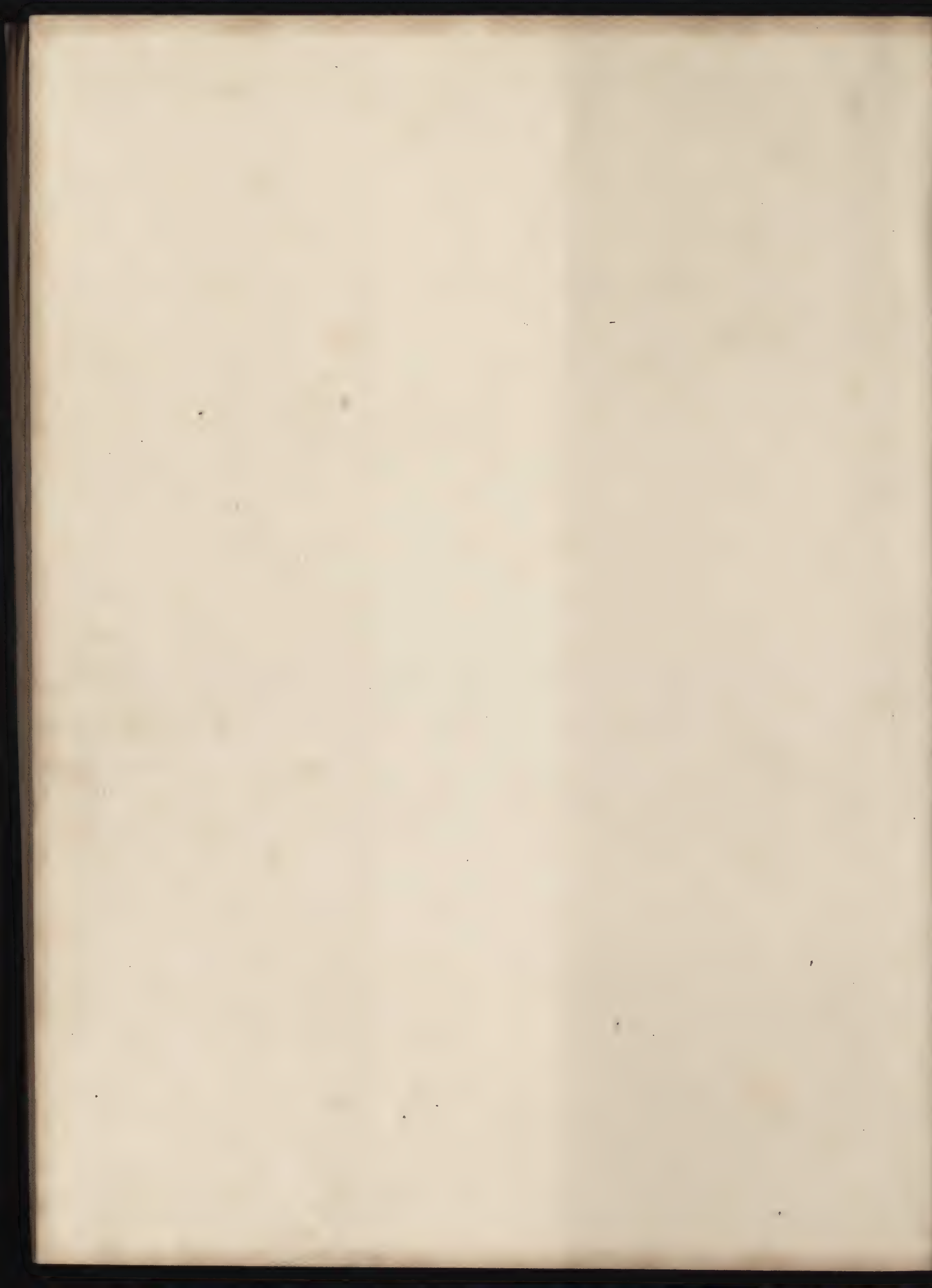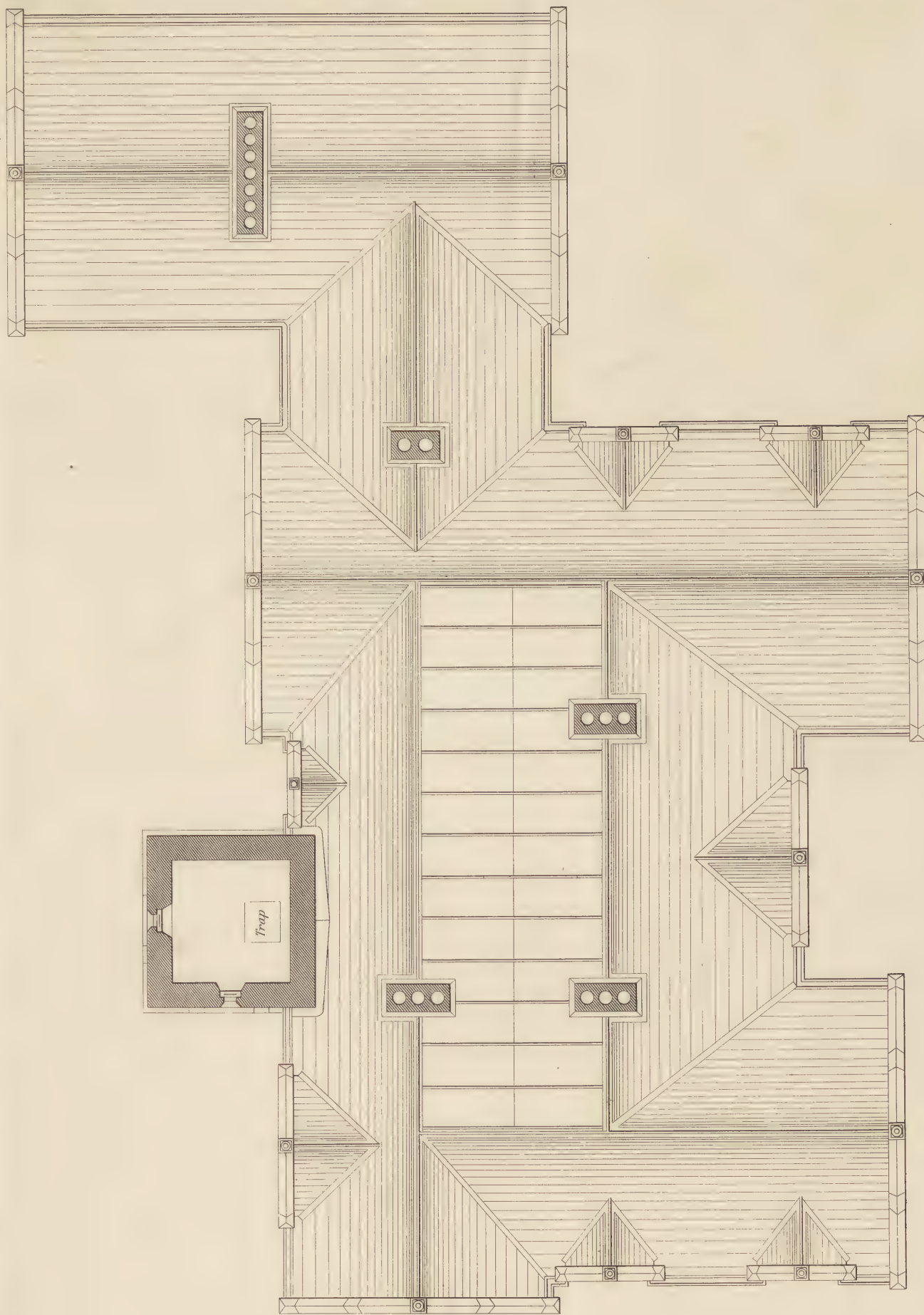
PLATE 3

ELIZABETHAN VILLA

Trap

PLAN OF ROOF

10   5   0   10   20   30   40   50 FEET
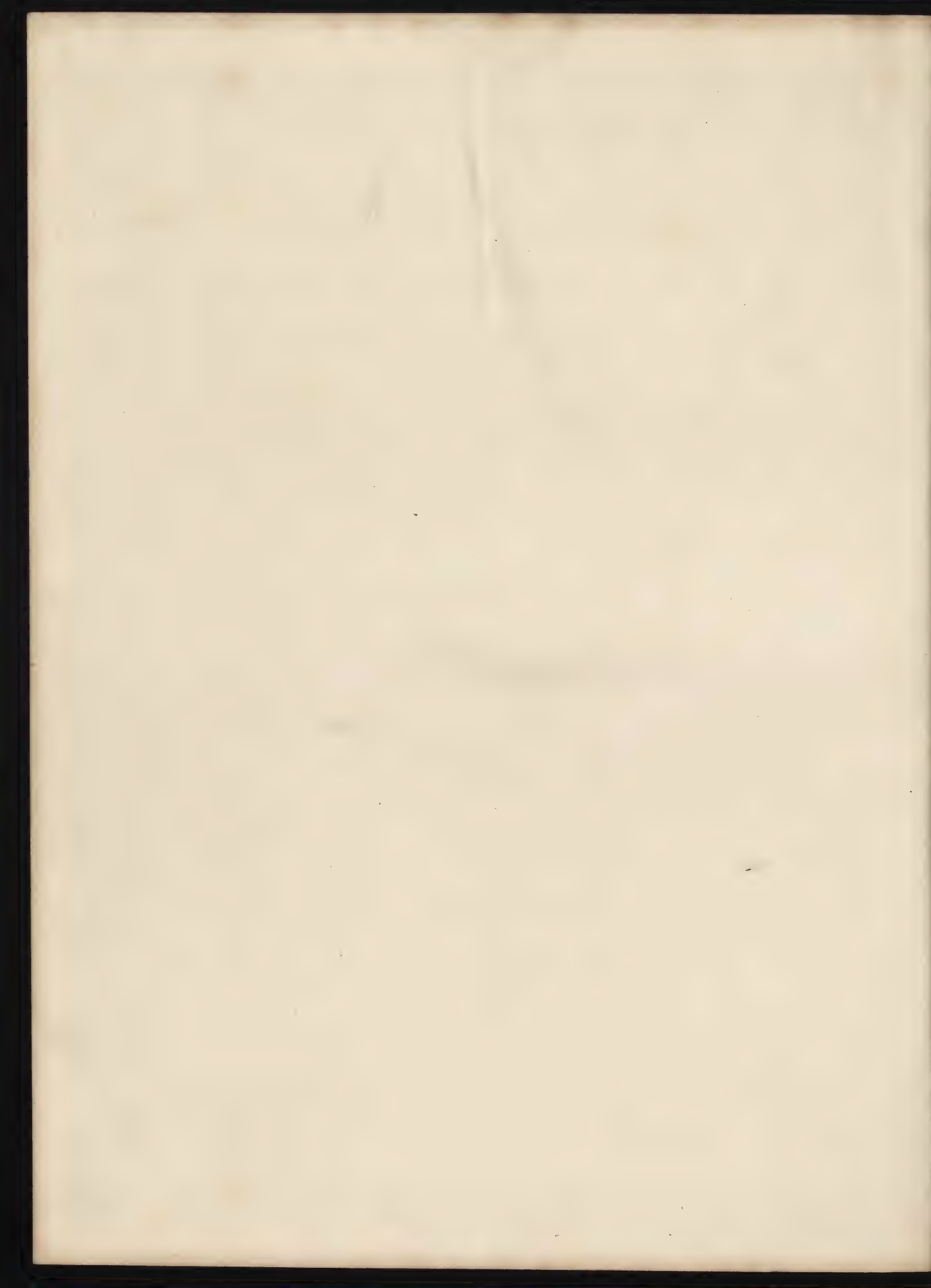
PLATES $\frac{S}{1}$ — $\frac{S}{8}$.

DESIGN FOR A VILLA IN THE ELIZABETHAN STYLE.

PLATES $\frac{S}{1}$ — $\frac{S}{8}$ contain a Design for a large and commodious villa in a modern treatment of the Elizabethan style, illustrated by a Ground Plan, Bedroom Plan, South Elevation, West Elevation, Section, Roof Plan, and Details. The drawings shew the villa to be built of stone; but if it is required for a locality where brick is more easily obtained, this material may be used for the walls, still employing stone for the finishings of the doors and windows, base-course, strings, quoins, factables, chimney heads, &c. The brick used should be red patent pressed, neatly tuck pointed with white lime. The exterior is designed with the greatest regard to economy, and is entirely devoid of superfluous ornament, greater care being taken to make the design a useful example for every-day building than a display of architectural eccentricities and embellishment, for which this style of architecture gives so great a licence. The three bow windows of dining-room, drawing-room, and morning-room are to be of polished stone throughout, having their blocking-courses plain pierced in the pattern shewn. The architraves of the other windows of the Ground Floor project about an inch from the finished surface of the wall, are unmoulded on their faces, but are cut on their outer edges to the form shewn on the two windows of the drawing-room on the South Elevation. The architraves of the windows over the three bays are similarly treated on their sides, but have cornices surmounted with flat square cut scroll work resting on the top of their architraves. The other windows of the Bedroom Floor, the large staircase window, and the windows of the kitchen wing have no architraves, being finished in the ordinary method with quoins, &c.

The string-course which goes round the whole building projects square, forming a sill to the windows of the Bedroom Floor.

The entrance door is ornamented with pilasters cut by projecting blocks at intervals; on the caps of these pilasters rest small channeled trusses, which support the cornice and the ornamental work over. The jambs and arch of the doorway have

DESIGN FOR A VILLA IN THE ELIZABETHAN STYLE.

a bead on their angles. The lower portion of the tower, to the height of the door-way cornice, is to be of polished stone in courses, with channeled horizontal joints. The quoins of the tower are to project about half an inch from the finished surface of the wall, and have shaped ends, as shewn on West Elevation. The gables and dormer windows are to be terminated with stone finials; these, with the greater portion of the other finishings of the house, are carefully delineated on the Plates of Details. The windows of the main portion of the house are to be filled with plate glass, with the exception of the staircase window, which should be filled with stained glass. The main roof to be covered with plain slates, and the roof of the tower with lead, the latter to be terminated with a ball and wrought-iron finial.

PLATE $\frac{s}{4}$.—GROUND PLAN.—The Ground Floor is spacious, and arranged with every regard to convenience around a large central hall, which measures 24 feet by 18 feet. This hall is approached from the entrance porch in tower by a vestibule, off which opens a gentlemen's room fitted with water-closet and wash-basin; at the opposite end of the hall is placed the main staircase, which should be constructed of oak or pitch pine, with massive newel posts, moulded handrail, turned balusters, &c., as shewn on Section. On the west of the hall are situated the morning-room and drawing-room, the former measuring 20 feet by 15 feet, the latter 25 feet by 17 feet 6 inches, exclusive of the bay windows. These two rooms are divided from each other by sliding doors. On the opposite side of the hall is placed the dining-room, measuring 26 feet by 18 feet, exclusive of the bow window and sideboard recess. The door opposite that of the morning-room opens into a passage communicating with the back lobby and kitchen, and has the store-room and butler's pantry opening from it. In the cupboard on the right of the sideboard recess in the dining-room is placed the service wicket, which allows the dishes, &c., to be passed readily from the kitchen or butler's pantry opposite, as the case may require: by this arrangement, which may be readily understood on referring to the plan, all communication between the public portion of the house and the kitchen department is effectually cut off. The kitchen measures 19 feet 6 inches by 18 feet 6 inches, is lighted by two large windows, and has a cook's pantry opening directly from it. The scullery, placed to the north of the kitchen, is large, being 18 feet 3 inches by 14 feet. The porch to the court is connected with the scullery. In the court a coal-house, wood-house, ash-pit, and privy are provided. Under the kitchen and scullery are placed the wash-house and laundry, lighted by large area windows, and reached by an external stair from the court, as shewn. Between the passage leading from the hall and the kitchen is placed the garden entrance, and the back or servants' staircase. The butler's pantry measures 13 feet

DESIGN FOR A VILLA IN THE ELIZABETHAN STYLE.

by 11 feet 6 inches, and is fitted with tables, sink, and fireplace complete. The store-room adjoining is also fitted with tables and cupboards. Underneath the hall is the wine cellar (shewn on section A—B), which is reached by a stair under the back stair and a passage under the passage from the hall to the kitchen: other cellars may be placed under the butler's pantry and store-room, gentlemen's room, and morning-room, if required.

The height of the Ground Floor in the main house is 14 feet; that of the kitchen wing is 12 feet.

PLATE $\frac{S}{5}$.—BEDROOM PLAN.—On the Bedroom Floor there are six large bedrooms, measuring respectively 25 feet 9 inches by 17 feet 6 inches; 20 feet by 15 feet; 18 feet by 17 feet; 18 feet by 12 feet 6 inches; 18 feet 3 inches by 15 feet; and 15 feet 6 inches by 14 feet: the bedrooms over the morning-room and dining-room have dressing-rooms attached. On this Floor there are also a bath-room, water-closet, and housemaid's closet. The principal bedrooms open from the gallery over the hall. The servants' rooms are situated on the second floor of the kitchen wing, and are reached by the back stair. The ceiling over the gallery and staircase is to be formed of richly moulded ribs, supported on ornamental brackets. A deep cove extends all round the ceiling, and its centre is panelled: this ceiling presents a favourable field for decoration, which would harmonize well with the stained glass window and the rich woodwork of the stair. This portion of the design is clearly shewn in section on Plates $\frac{S}{2}$, $\frac{S}{3}$.

The height of the Bedroom Floor in the main portion of the house is 13 feet, and in the kitchen wing 10 feet.

PLATE $\frac{S}{1}$ contains the South Elevation or garden front. It shews the large bow windows of the drawing-room and dining-room, and between them the large window of staircase; underneath this, and between the two south gables of main house, is a small raised terrace or platform for the reception of stands of flowers, or other orna-mental objects. On the right of the dining-room gable is shewn the garden front of the kitchen wing.

PLATES $\frac{S}{2}$, $\frac{S}{3}$, contain the West Elevation and Section at A—B.

The Elevation shews in the centre the bow window of morning-room and its gable; on the left, the entrance doorway and tower, with the kitchen wing appearing behind it; and on the right are shewn the two flank windows of the drawing-room, and the side of its bay.

DESIGN FOR A VILLA IN THE ELIZABETHAN STYLE.

The Section cuts the Ground Floor on the line A—B, through the dining-room, hall, and drawing-room looking south, the respective bedrooms over, and the gallery on the first floor. Under the hall the section line cuts through the bins of the wine cellar.

PLATE $\frac{S}{8}$ contains the Roof Plan.

PLATES $\frac{S}{6}$, $\frac{S}{7}$, contain the Details of the entrance doorway, the ornamental heads of the first floor windows over the bays, the architraves of the lower windows, the main gables and terminals, the cornice, quoins, and string-course of tower, the general eave cornice, and chimney heads. The cornice of the bay windows to be of the same profile as that of the entrance doorway. These Details are drawn to the scale of $\frac{3}{4}$ inch to 1 foot.
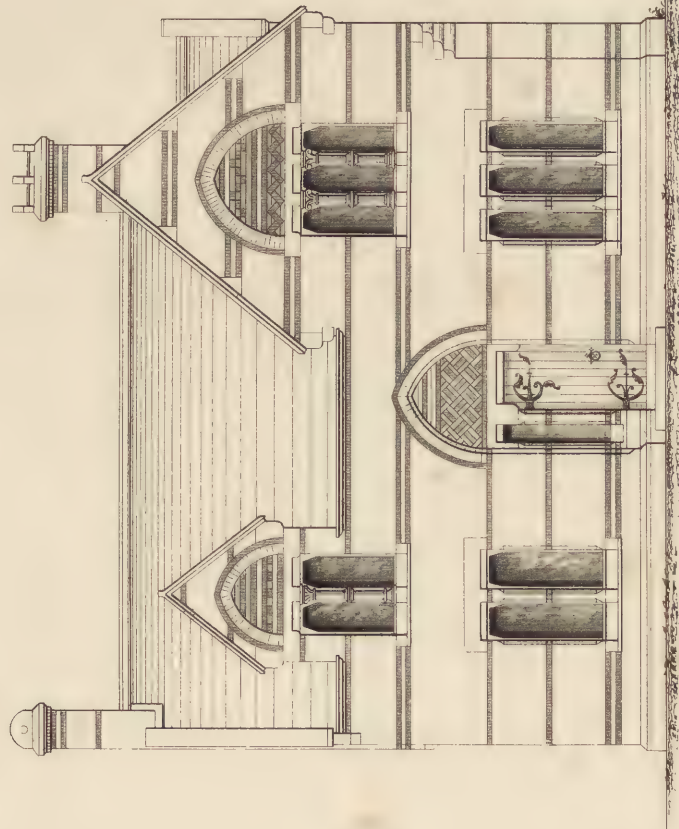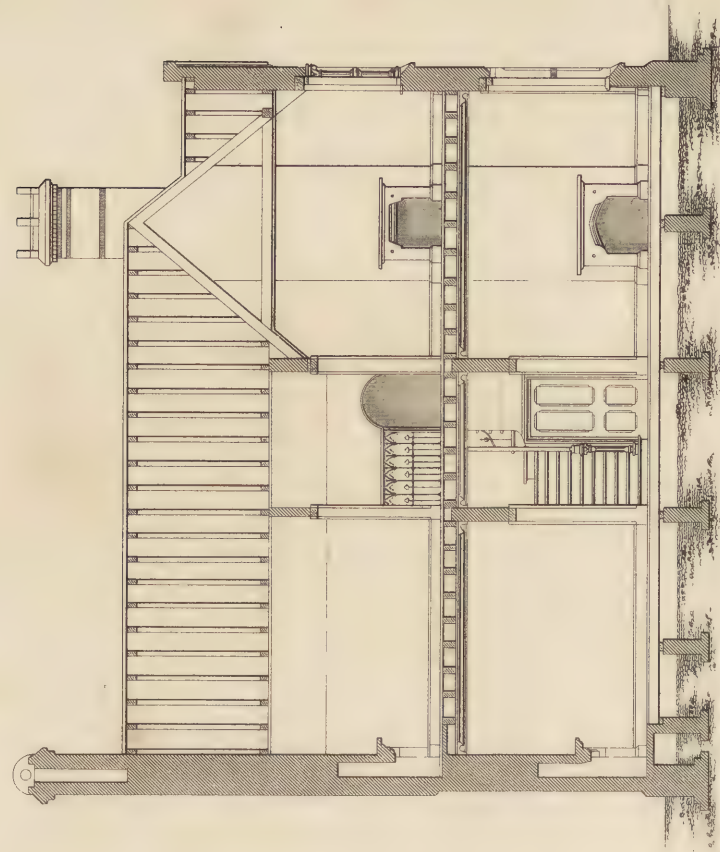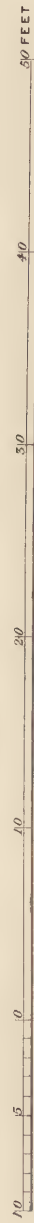
GOTHIC LODGE

ELEVATION

SECTION at A.B.

10   5   0   10   20   30   40   50 FEET

BEDROOM
13'-6" × 12'-0"

BATH ROOM & W.C.

BEDROOM
14'-3" × 14'-0

BEDROOM
14'-0" × 13'-0"

LANDING

CLOSET

B

A

B

A

BEDROOM PLAN

KITCHEN
13'-6" × 12'-0"

PANTRY

SCULLERY
11'-6" × 8'-0"

Sink

COALS

ASHES

PRIVY

PORCH

PARLOR
14'-0" × 14'-0"

PARLOR
14'-0" × 12'-9"

B

A

GROUND PLAN

10   5   0   10   20   30   40   50 FEET

WILLIAM MACKENZIE GLASGOW EDINBURGH & LONDON

— DETAILS —
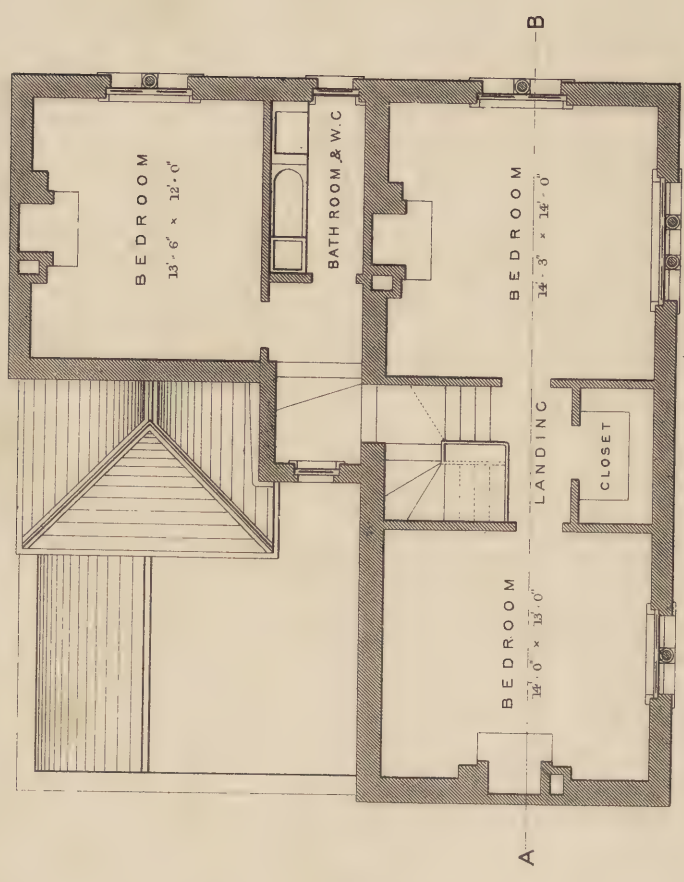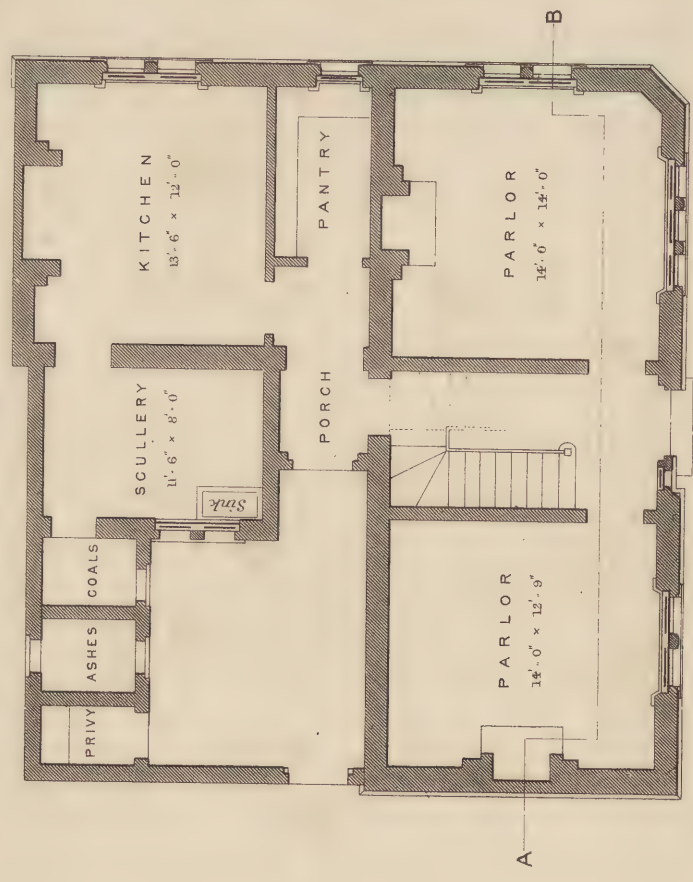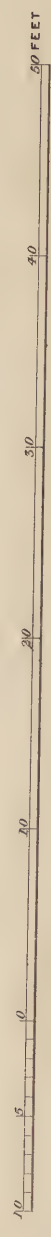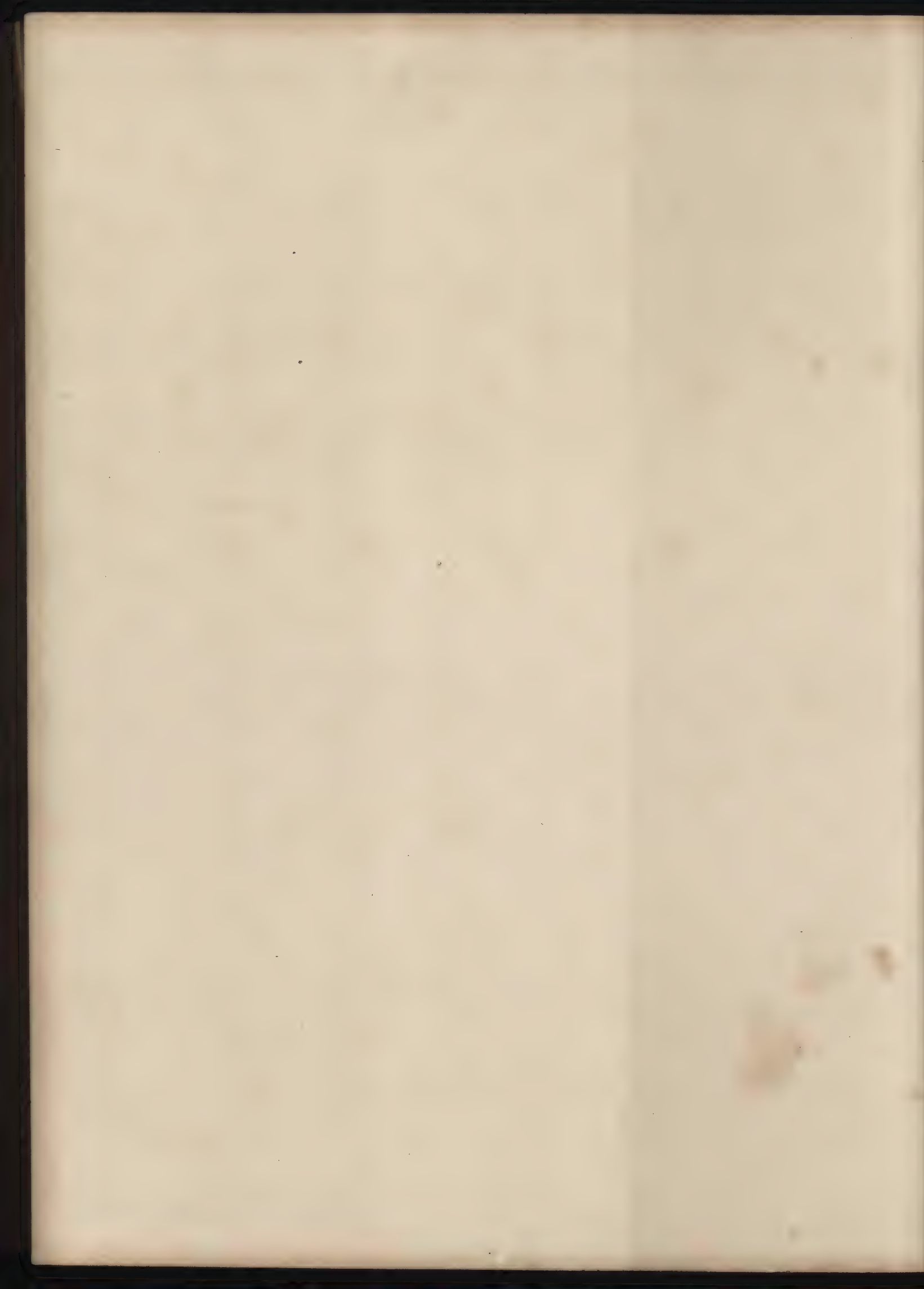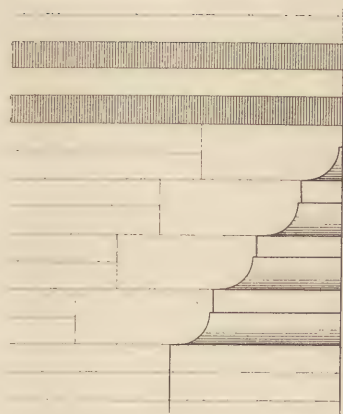
ANGLE CORBEL
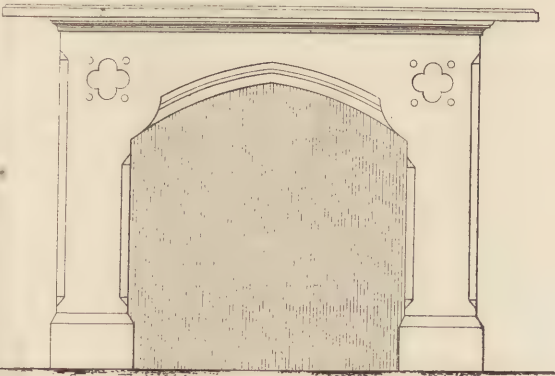
PARLOUR CHIMNEY PIECE
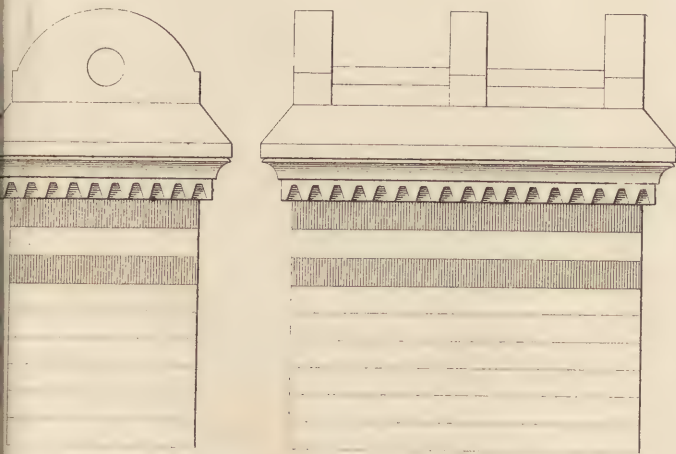
END   SIDE

CHIMNEY HEADS
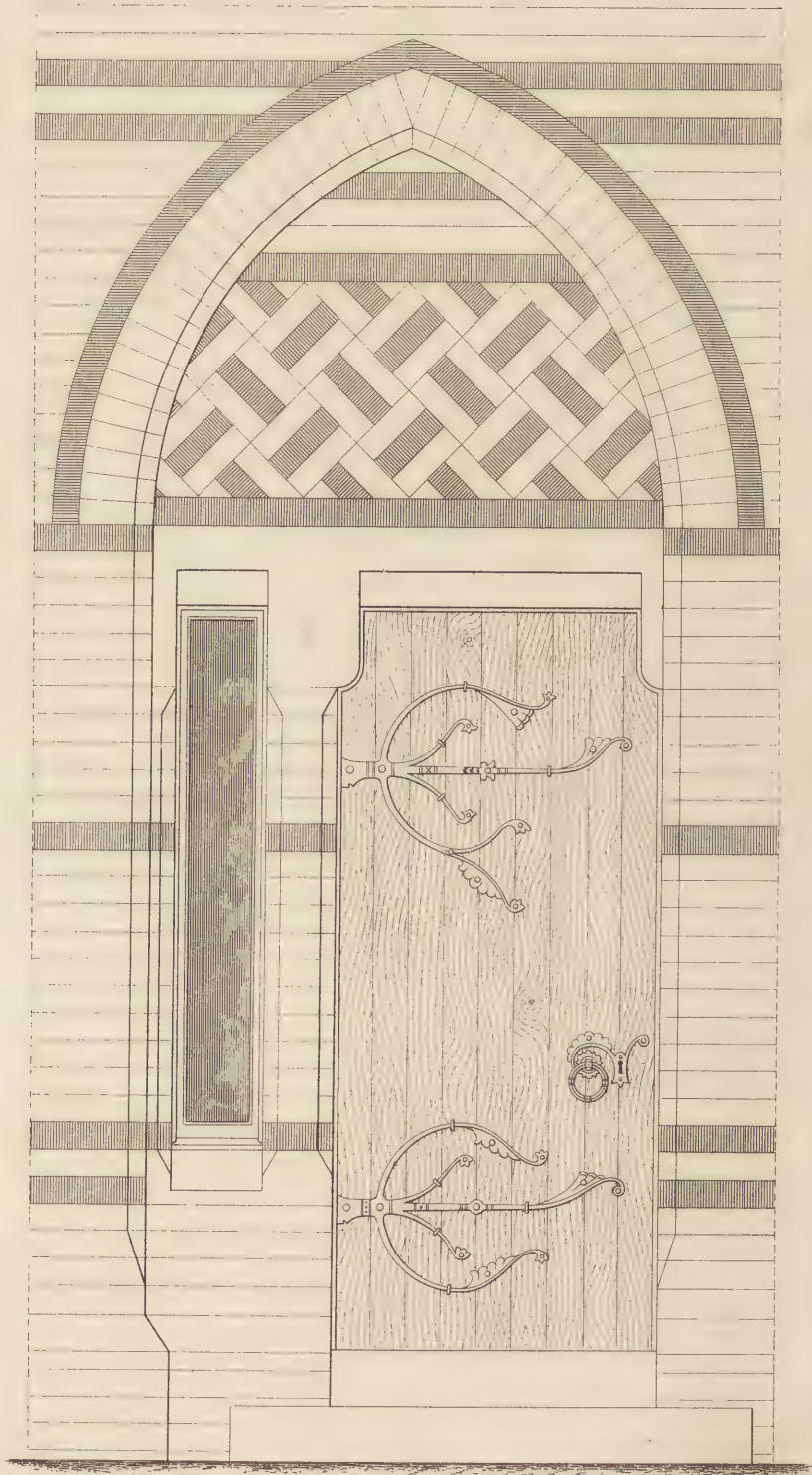
ENTRANCE DOORWAY
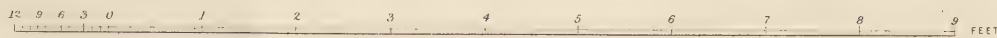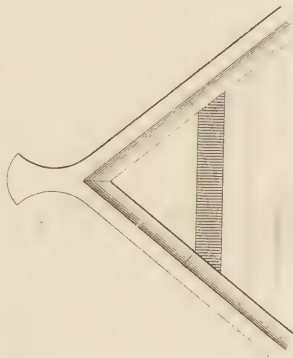
PLATE 4

BEDROOM WINDOW
IN FRONT GABLE
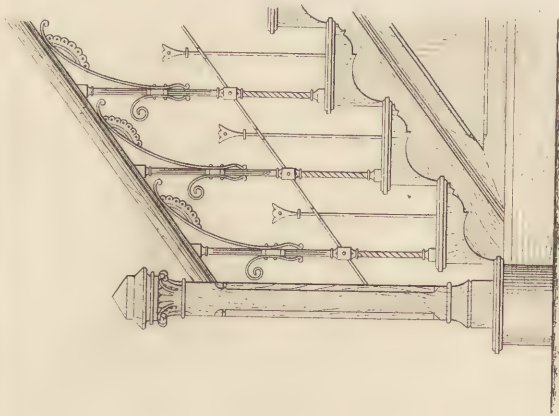
NEWAL BALUSTERS &c. OF STAIR
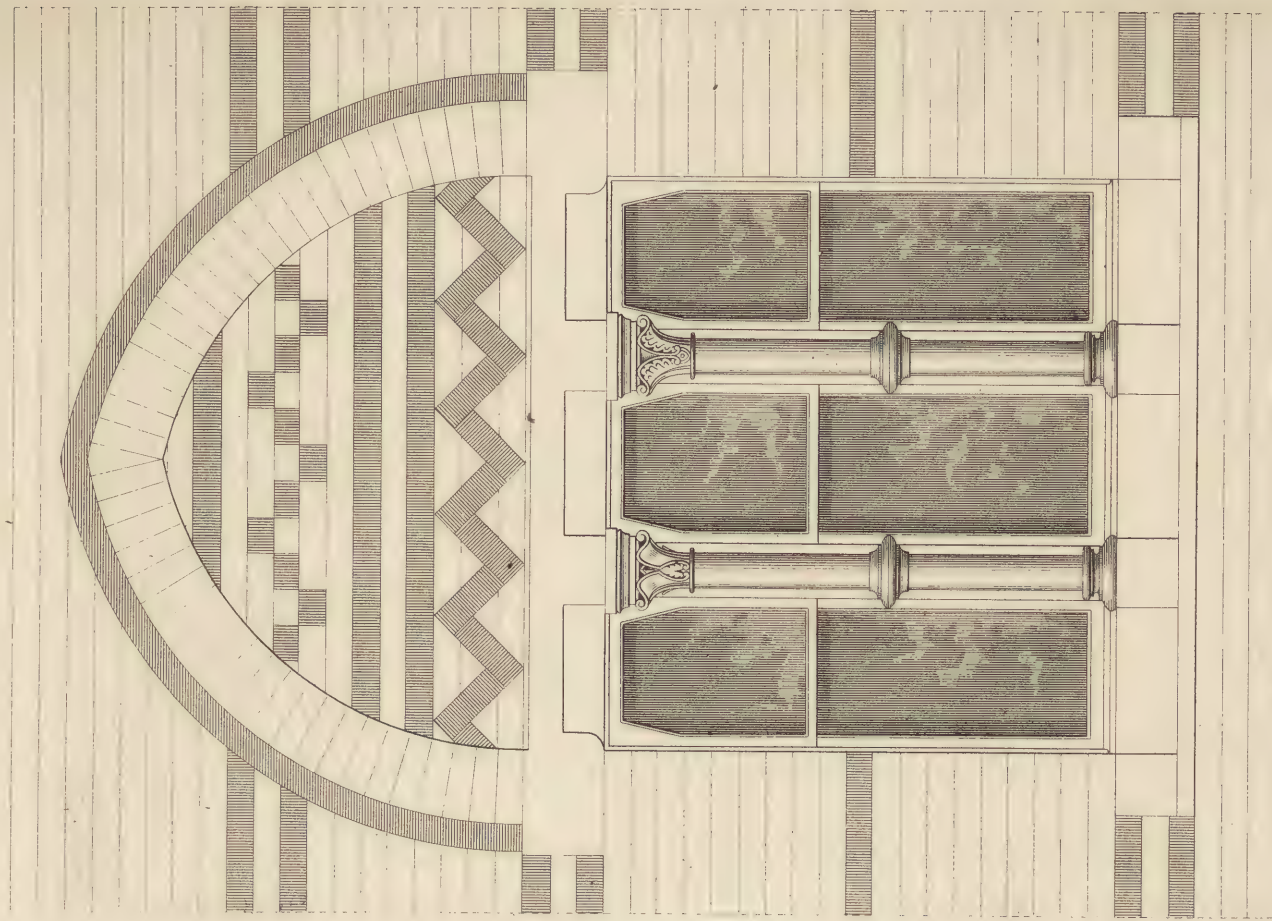
GABLE TERMINATIONS

PARLOUR WINDOW

0 1 2 3 4 5 6 7 8 9 FEET

12° 9 6 3° 0 1

WILLIAM MACKENZIE GLASGOW EDINBURGH & LONDON

PLATES $\frac{T}{1}$ — $\frac{T}{2}$.

DESIGN FOR A GOTHIC LODGE.

PLATES $\frac{T}{1}$ — $\frac{T}{2}$ contain a design for a Lodge in the Early Gothic style, illustrated by a Ground Plan, Bedroom Plan, Elevation, and Section. It is shewn to be built of red and black brick, with a sparing use of stone. The portions intended to be of stone are the steps and lintels of the doors, the weathering of the base course, the corbel at angle, the sills, lintels, and columns of windows, the spurstones and factables of gables and dormers, and the chimney cappings. The walls should be faced with rich red and black pressed bricks disposed as shewn on the Elevation, but grey stock brick may be used with pressed red and black brick bands. (See Ornamental Brickwork.)

The windows to be filled with plate or leaded glass in wood frames, with shaped heads, as shewn on the Elevation, and made to open inwards.

The external doors to be hung with ornamental wrought-iron hinges, as shewn.

The roofs to be covered with plain slates, or with green and blue in bands. An ornamental ridge cresting may be added if preferred.

GROUND PLAN.—On the Ground Floor there are two parlours, measuring respectively 14 feet by 14 feet, and 14 feet by 12 feet 9 inches; a kitchen 13 feet 6 inches by 12 feet; a scullery 11 feet 6 inches by 8 feet; and a convenient pantry off the back lobby.

A coal-house, ash-pit, and privy are provided in an outbuilding in the yard.

The height of the Ground Floor is 10 feet.

BEDROOM PLAN.—On the First Floor there are three bedrooms, measuring respectively 14 feet 3 inches by 14 feet, 14 feet by 12 feet 9 inches, 13 feet 6 inches by 12 feet: all well lighted and fitted with fireplaces. There are also a bath-room and store-closet on this floor.

The height of the Bedroom Floor is 9 feet.

The Section cuts, on the line A—B, the two parlours and the front lobby, shewing the staircase and the bedrooms and landing over.

ELEVATION

SINK

KITCHEN
11' × 11'

COURT

COALS

ASHES

PANTRY

PRIVY

PARLOR
12' × 10'

BEDROOM
8' 6' × 8' 0'

BEDROOM
12' × 10'

LOBBY

PLAN

10   5   0   10   20   30   40   50 FEET
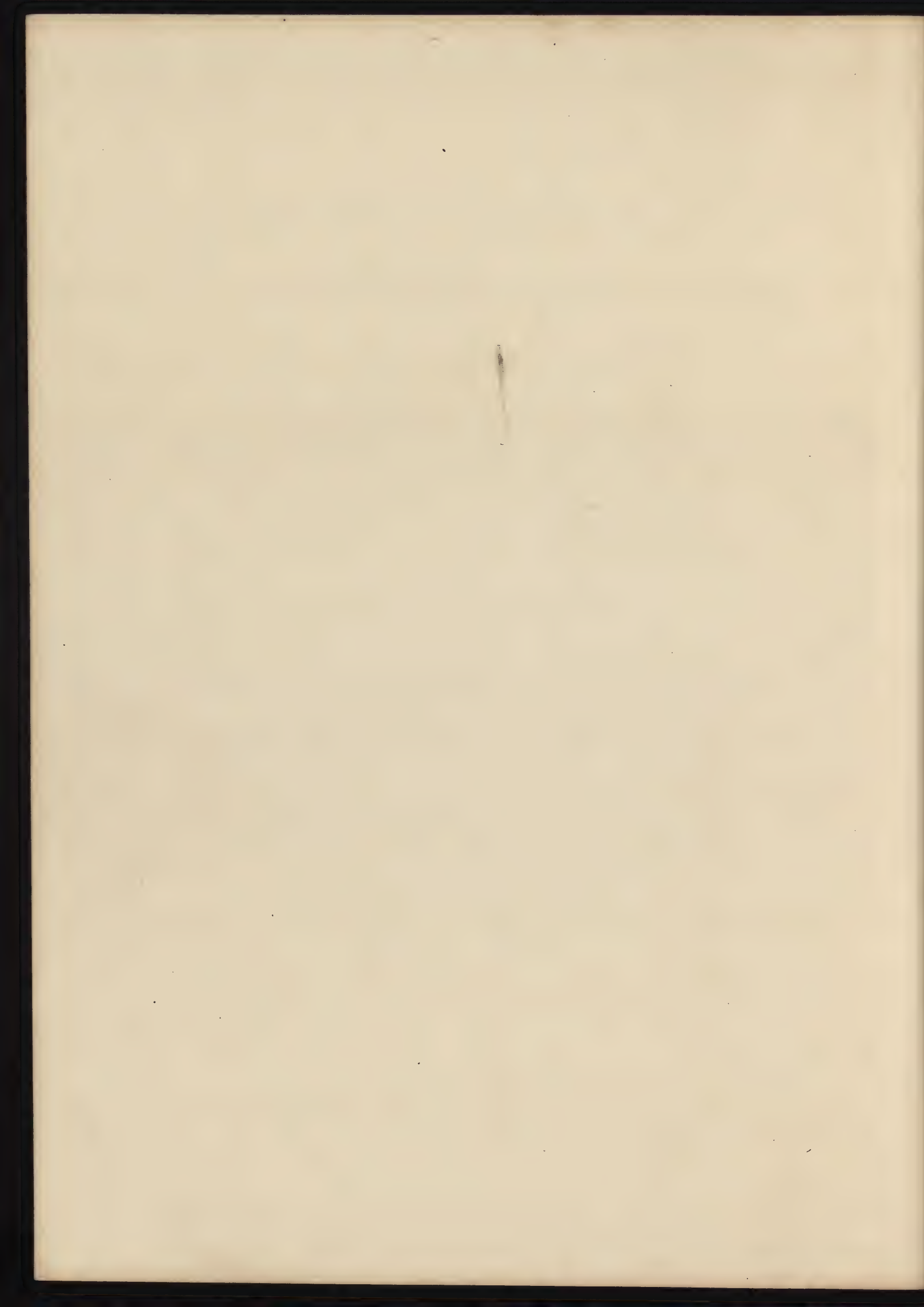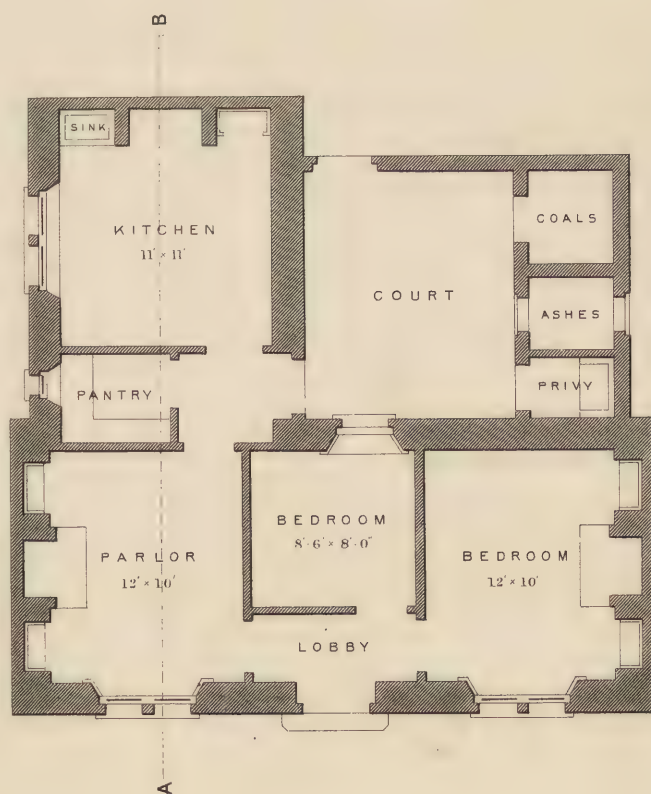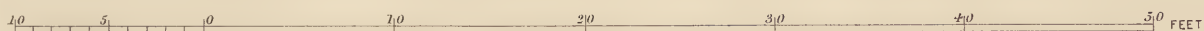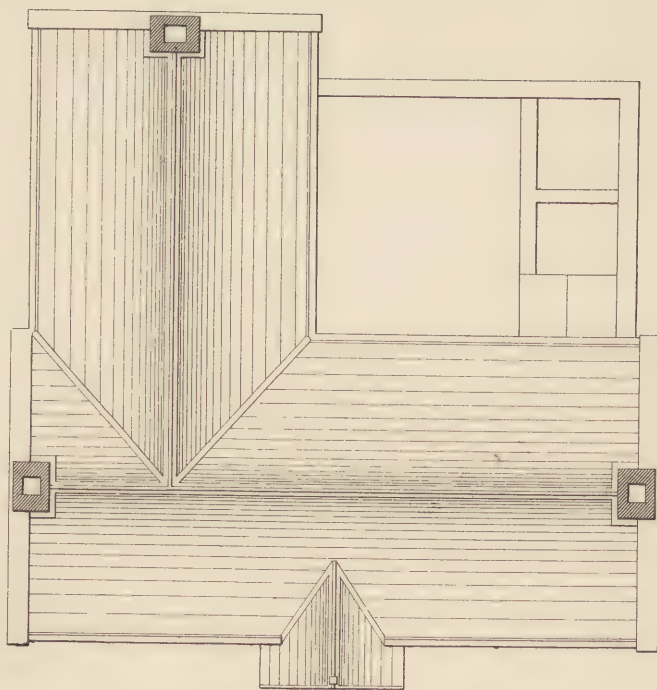
SECTION at A.B.

PLAN of ROOF
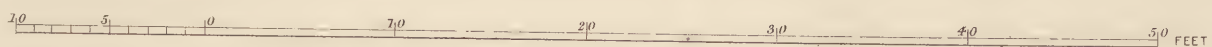
PLATES $\frac{U}{1}$ — $\frac{U}{2}$.

GAMEKEEPER'S COTTAGE.

PLATES $\frac{U}{1}$ — $\frac{U}{2}$ contain a Design for a Gamekeeper's, Gardener's, or Bailiff's Cottage, illustrated by a Plan, Elevation, Section, and Plan of the Roof. The masonwork of the cottage is of the simplest character, being entirely free of ornament or mouldings. The walls may either be built of common rough rubble, or of parpoint, with dressings to the doors, windows, and chimneys.

To give a slight character to the Design, a neat timber canopy is placed over the entrance door, supported upon open framed brackets similar to those shewn on Plates $\frac{D}{1}$, $\frac{D}{2}$.

PLAN.—The cottage, consisting of one floor, contains a parlour, or general living room, measuring 12 feet by 10 feet; two bedrooms, respectively 12 feet by 10 feet, and 8 feet 6 inches by 8 feet, and a convenient kitchen, &c.

The kitchen is situated in the back wing and communicates with the living room by the back lobby, off which a pantry is placed. The kitchen measures 11 feet by 11 feet, and is fitted up with a cupboard and sink.

A coal-house, ash-pit, and privy are provided in outbuildings.

The height of the floor is 10 feet 6 inches.

SECTION.—The Section cuts, on the line A—B, the parlour, pantry, and kitchen.

ORNAMENTAL BRICKWORK

DORMER WINDOWS

No 1

No 2

12 9 6 0 1 2 3 4 5 6 7 8 9 10 11 FEET

CORNICES

AT A.B.   AT C.D.

WILLIAM MACKENZIE. GLASGOW EDINBURGH & LONDON
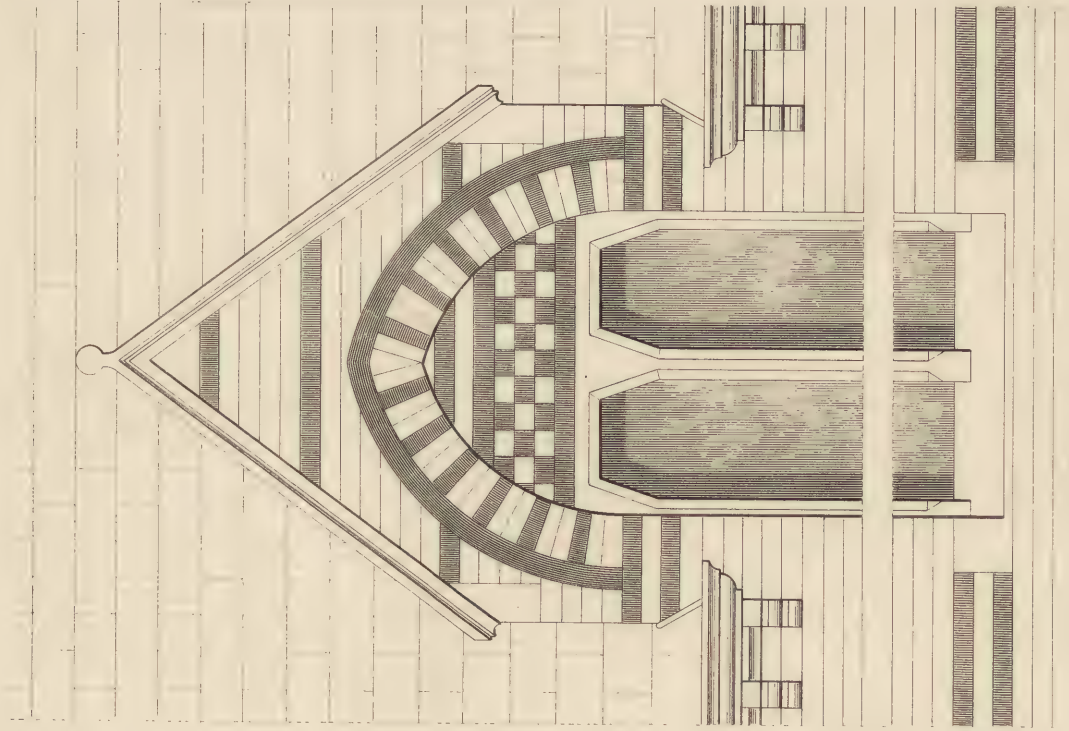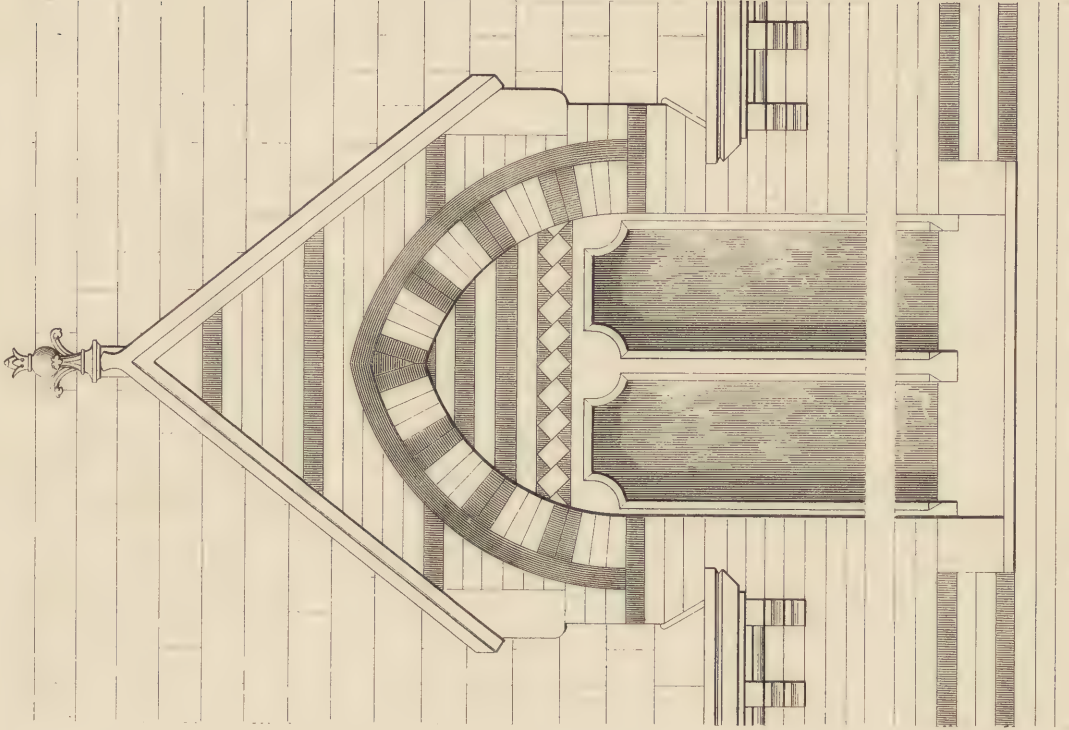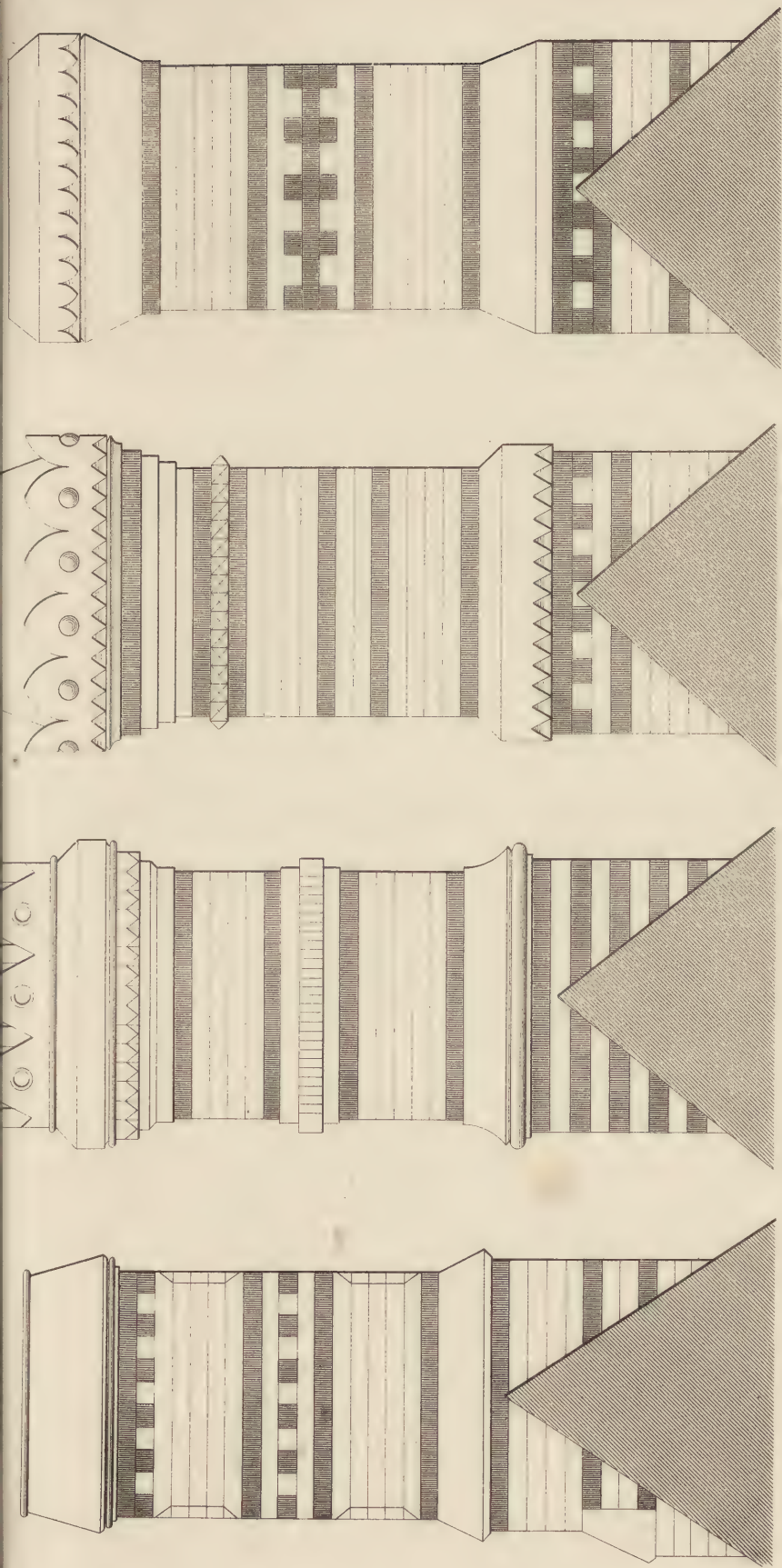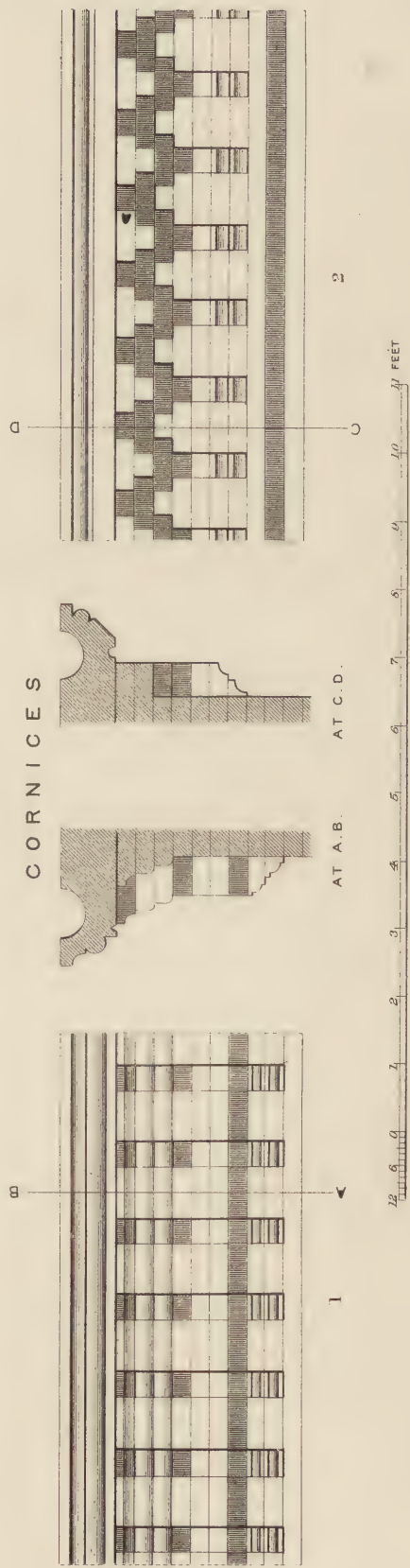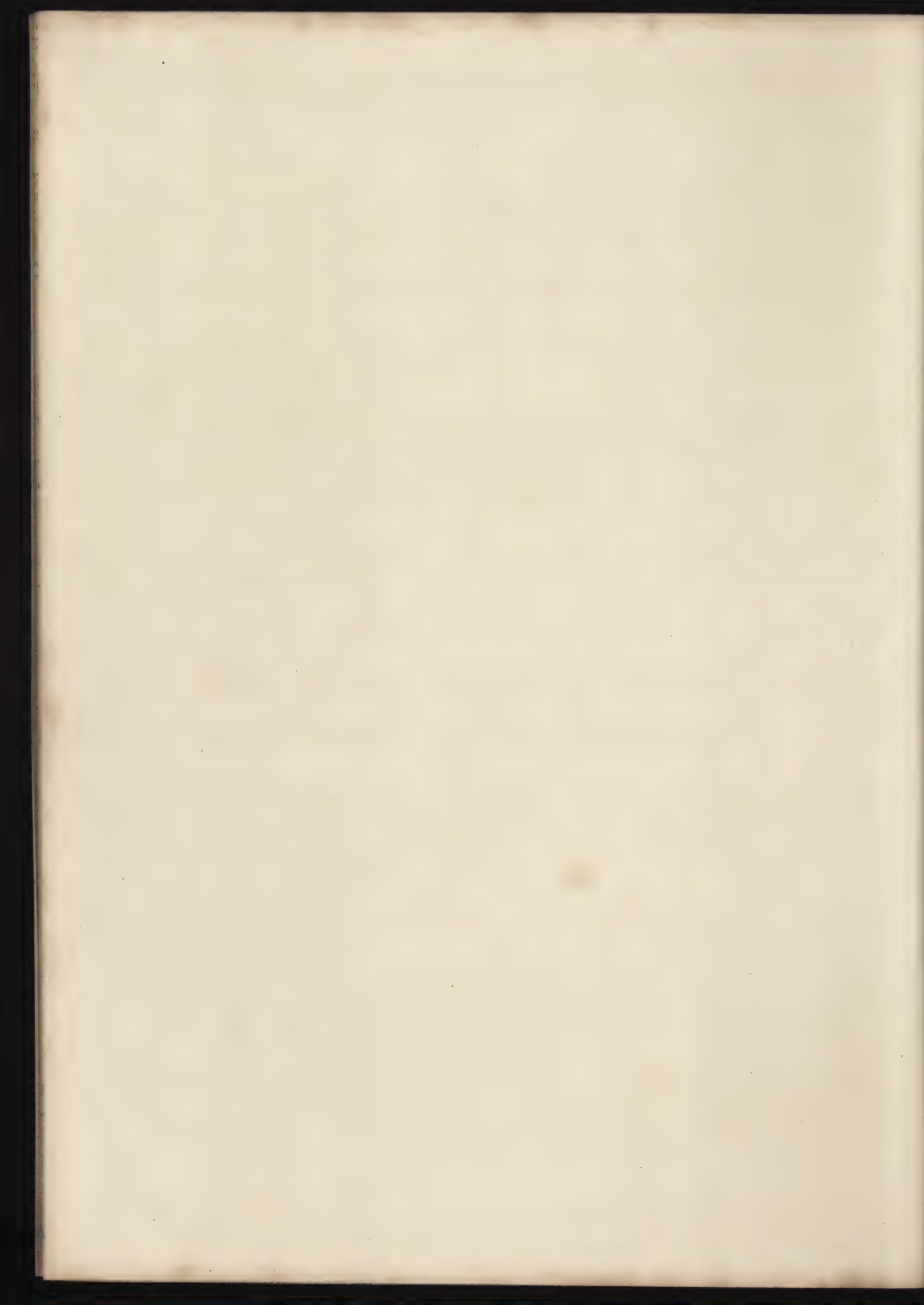
PLATE X.

ORNAMENTAL BRICKWORK.

PLATE X contains designs for dormer windows, chimneys, and cornices, in ornamental brickwork.

The dormer windows are of a simple, although very effective character, being constructed of plain brick of two colours, with stone finishings. The colours of the bricks used in these windows should be red and black, which would harmonize well with the light-coloured stone of the sills, frames, and factables. The tympani over the frames, and the frames themselves, are to be sunk a brick-breadth (about $4\frac{1}{2}$ inches) from the face of the arch or wall. The tympani to be inserted, in black and red brick, of the patterns shewn.

Numerous examples of this class of dormer windows are given in the various designs for Gothic houses throughout the work, and their treatment in all important details is quite the same as that of the two in our present Plate. We may here remark, that when several dormer windows are introduced in one building, it is advisable to have all their tympani of different designs, and to change their other details as much as possible. Variety, apart from being a principle of Gothic Art, adds great interest to all architectural features.

The chimneys are designed on the same principle as the dormers, the brickwork being kept as simple as possible.

In Fig. 1 all the bricks are plain square, except at the angles, where simple splayed and stop bricks are used. The capping and weatherings are of stone.

In Fig. 2 the cornice under the capping has one course of notched headers and one course of splayed bricks, while the band in the centre of the shaft has one course of narrow angled headers, as shewn. The top of the stone capping is cut into a set of wind guards.

In Fig. 3 all the bricks are plain, except one course of nail-head bricks inserted as a necking.

In Fig. 4 all moulded or cut bricks are avoided, and the simplest treatment is observed throughout the design.

The two remaining designs on this Plate are for rich brick cornices of seven and nine courses deep. Fig. 1 consists of a series of brackets, worked out from the wall, as shewn in the Section at A—B, with plain and moulded bricks of two colours, and bearing the gutter-course, which may be of stone or iron. Fig. 2 is formed of bricks, for the greater part plain, set in a peculiar way to give an open arcaded effect. The gutter-course rests on the upper set of headers, which are supported on two sets of stretchers that bridge over the spaces between the moulded brackets. The gutter-course may, in this case, be either of stone or cast iron.
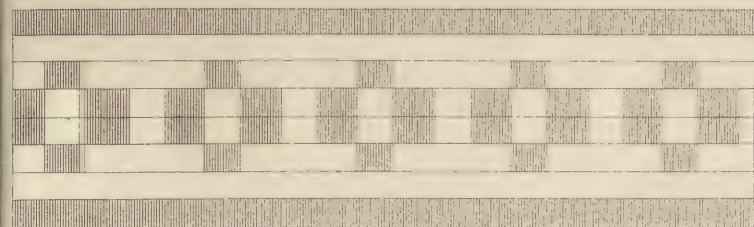
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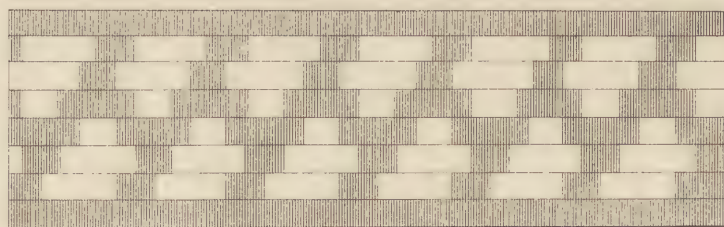
16
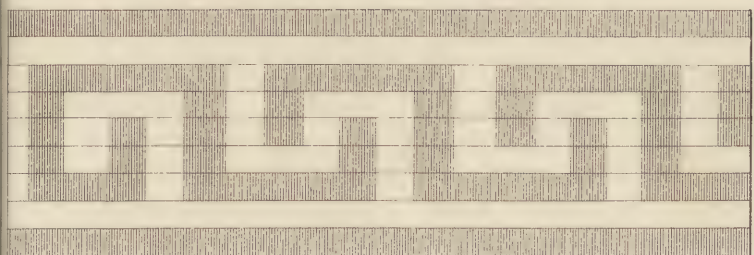
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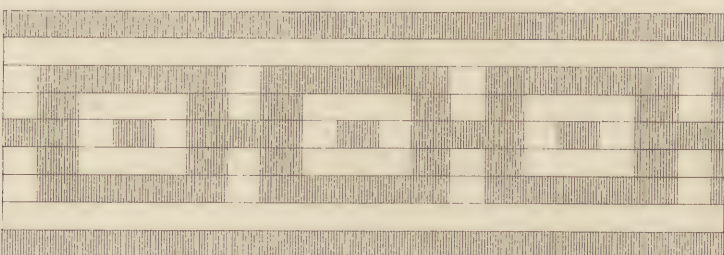
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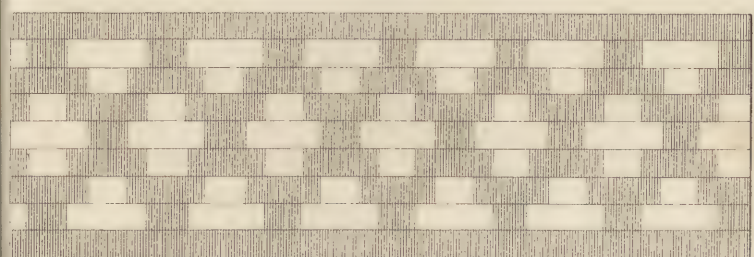
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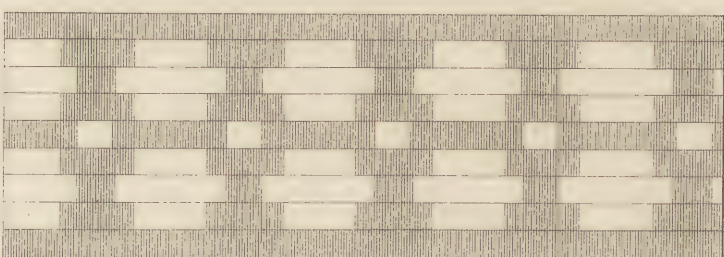
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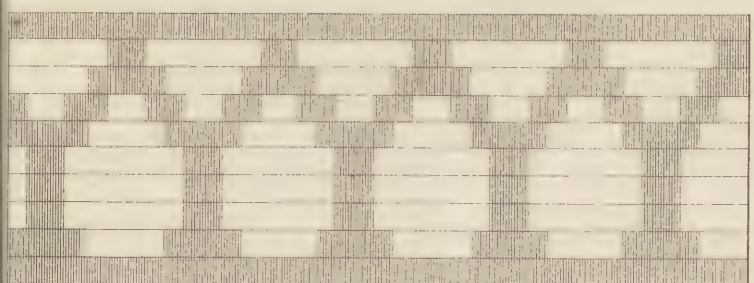
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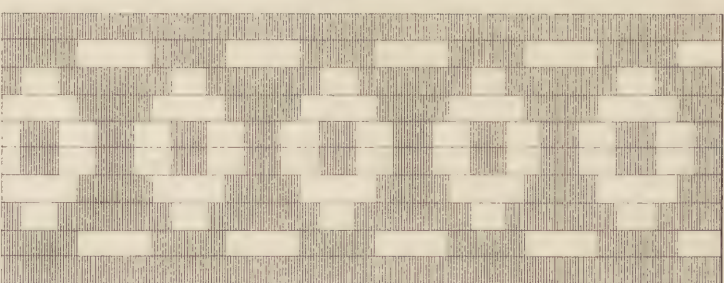
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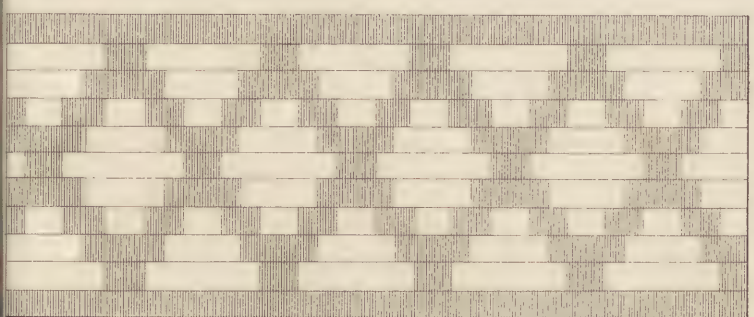
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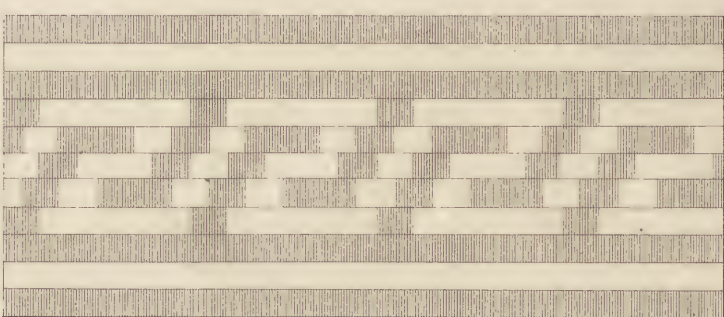
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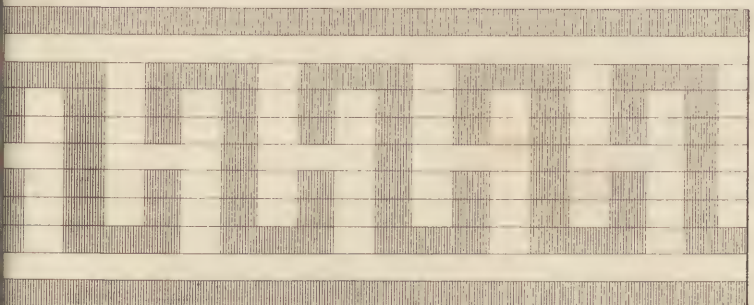
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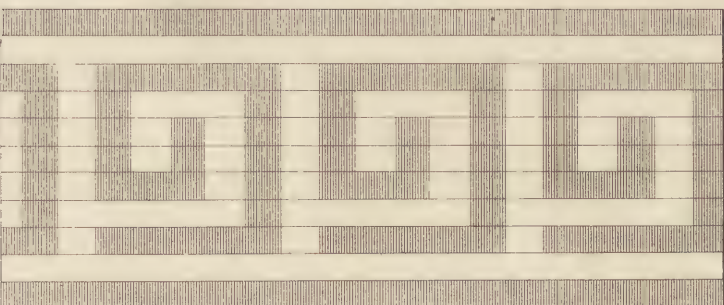
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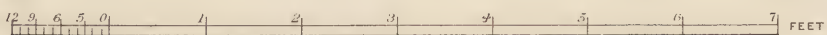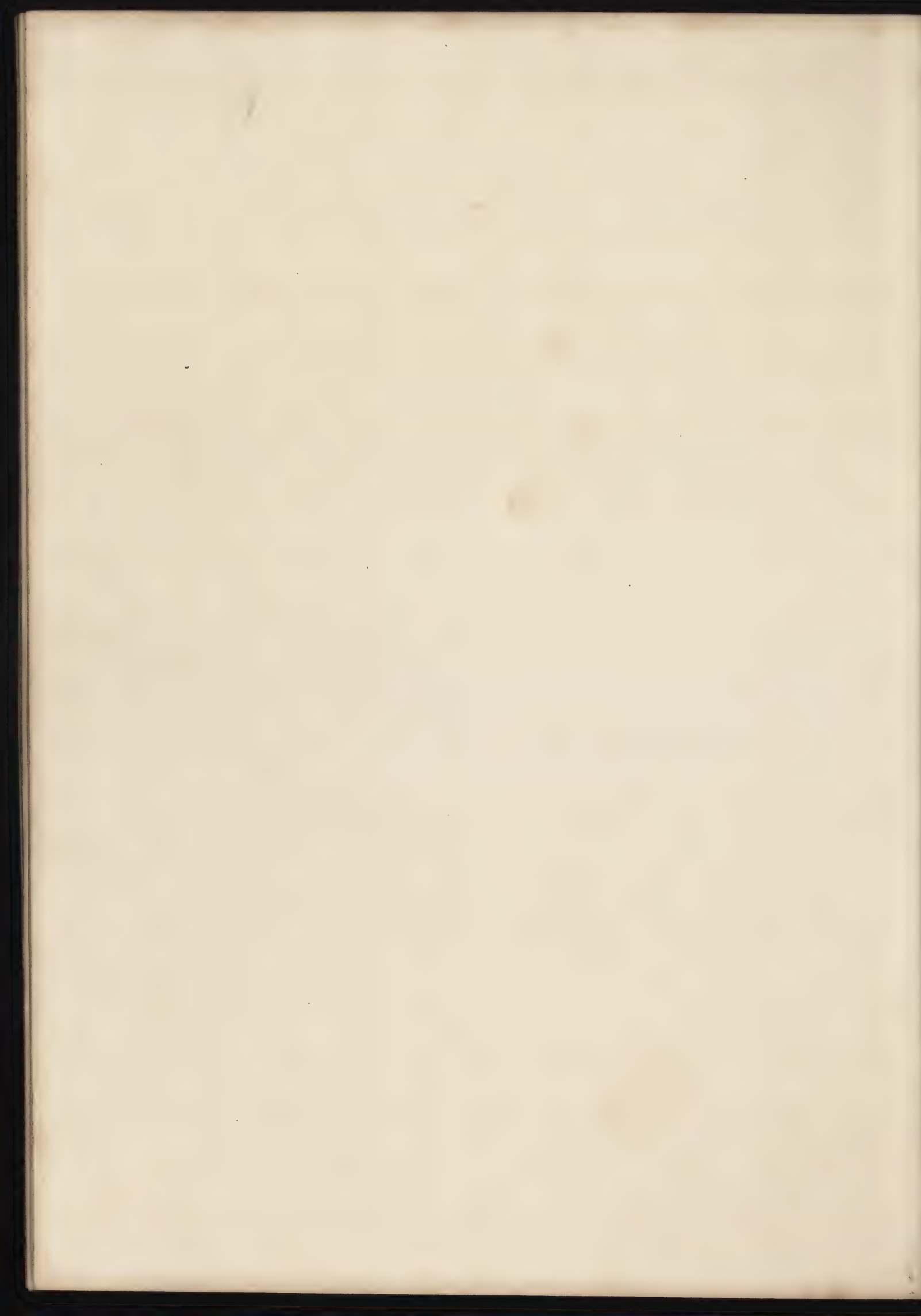
BANDS

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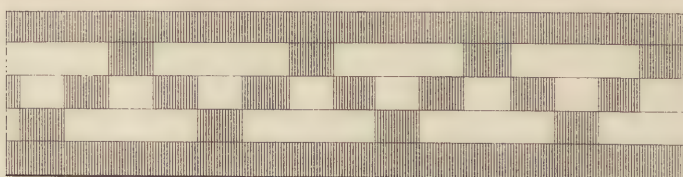
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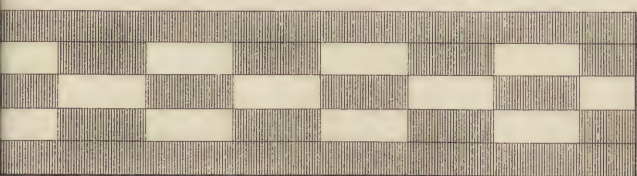
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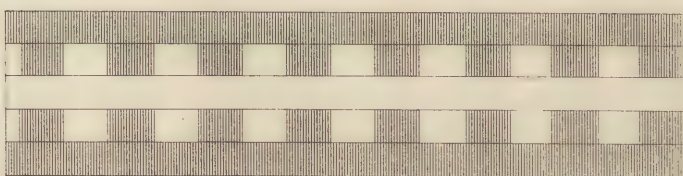
4

5

6

7

8

9

10

11

12

13

14

12 9 6 3 0 1 2 3 4 FEET
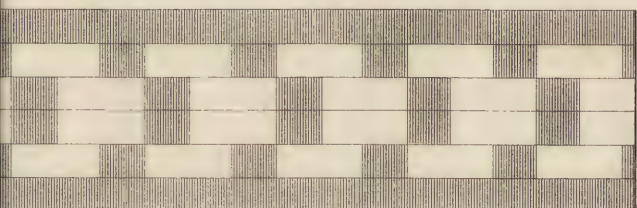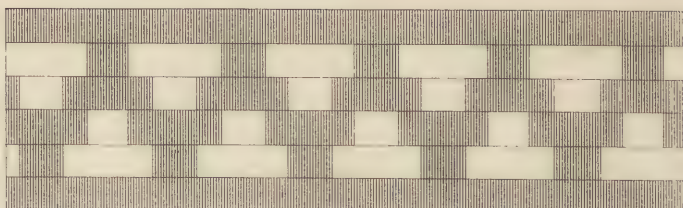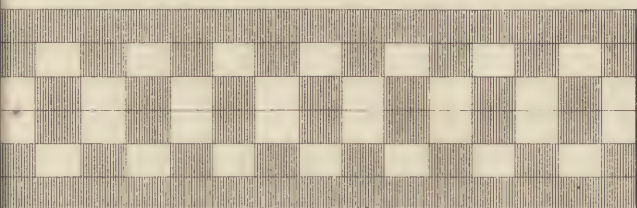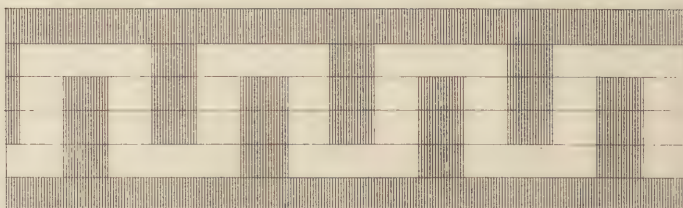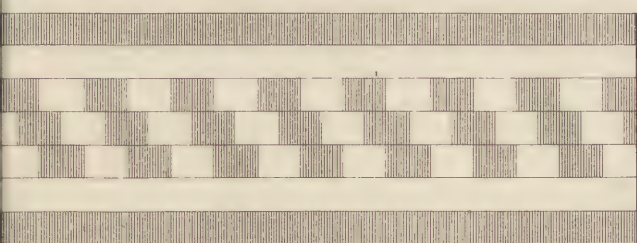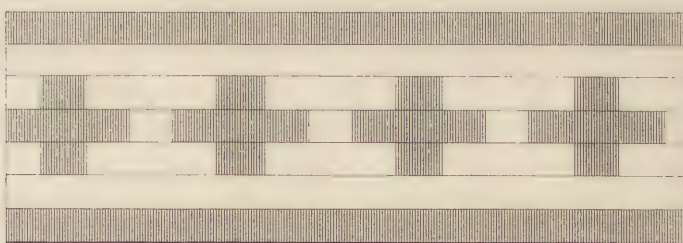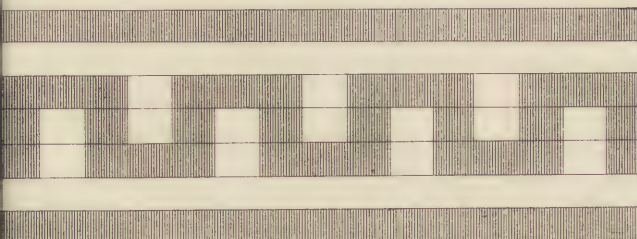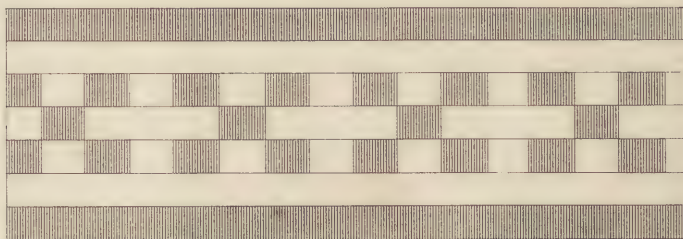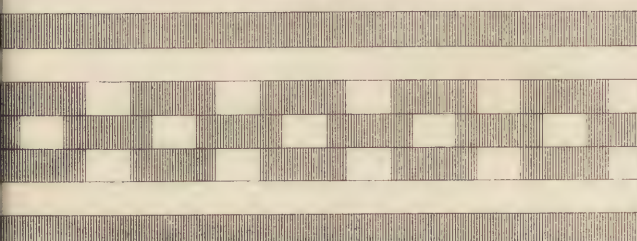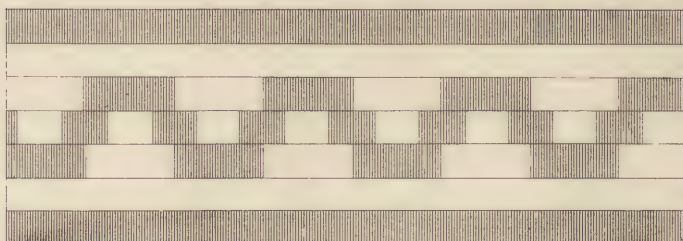
ORNAMENTAL BRICKWORK.

BANDS.

PLATE W contains fourteen Designs for flat brick bands of five and seven courses deep. All may be executed with the ordinary sized plain pressed bricks laid header and stretcher. In the Designs Nos. 1, 3, 4, 5, 6, 7, 9, 13, and 14, the bricks are of the usual manufactured size, no cut ones being required; in the others a few cut bricks will have to be used to produce the patterns.

The bands may be composed of black and red, red and buff, black and buff, black, red, and buff, or other coloured bricks, as the case may demand or individual taste direct. The shaded portions in the drawings shew those which are to be of the darkest coloured brick used in the formation of the bands.

As full particulars regarding the use and general treatment of bands are given in our Essay, under the head of "Ornamental Brickwork," it is only necessary in this place to briefly describe the Designs in the present Plate.

No. 1.—A band of five courses, which should be of two colours of brick, either black and red, or red and buff. A band of three courses may be formed by removing the outside black courses; but in that case it would only be suitable for a grey stock wall, which would give the necessary relief to the red pressed brick margins.

No. 2.—Also of five courses, is formed from the preceding by the addition of black headers at intervals in the second and fourth courses. This band may be of two or three colours. The pattern and margins may be of black and the ground red; or the margins of black, the pattern of red, and the ground of buff. Two cut bricks, each $6\frac{3}{4}$ inches long, will have to be used between the black headers in the second and fourth courses.

No. 3.—A band of five courses, composed of stretchers only. It may be in two or three colours, in the same manner as No. 2.

ORNAMENTAL BRICKWORK.

No. 4.—A band of five courses, which should be of two colours of brick, either black and red or red and buff.

No. 5.—A band of seven courses. This should be, like the last, of two colours of brick only.

No. 6.—Also a band of seven courses, formed of headers and stretchers. It may be of two or three colours, treated in the same way as No. 2, which is a Design of a similar nature.

No. 7.—A band formed on the same principle as No. 5, and should, like it, be of two colours only.

No. 8.—A fret pattern of seven courses. It can only be introduced in two colours of brick.

No. 9.—A band of seven courses, the pattern of which is formed entirely of headers of two colours. The margins may be of a different coloured brick to the dark headers in the pattern.

Nos. 10, 11, 12, 13, and 14 are bands which have a very good effect in buildings, if introduced in black and red bricks. They are suitable for red pressed or grey stock brick walls. If used in walls of large buildings, which are of grey brick, the bands may be increased to nine courses, by the addition of a red pressed course on each marginal black course shewn in the Plate. They may, in like manner, be reduced to five courses to suit small buildings, by removing the present black margins, but their effect will not be so satisfactory or decided.
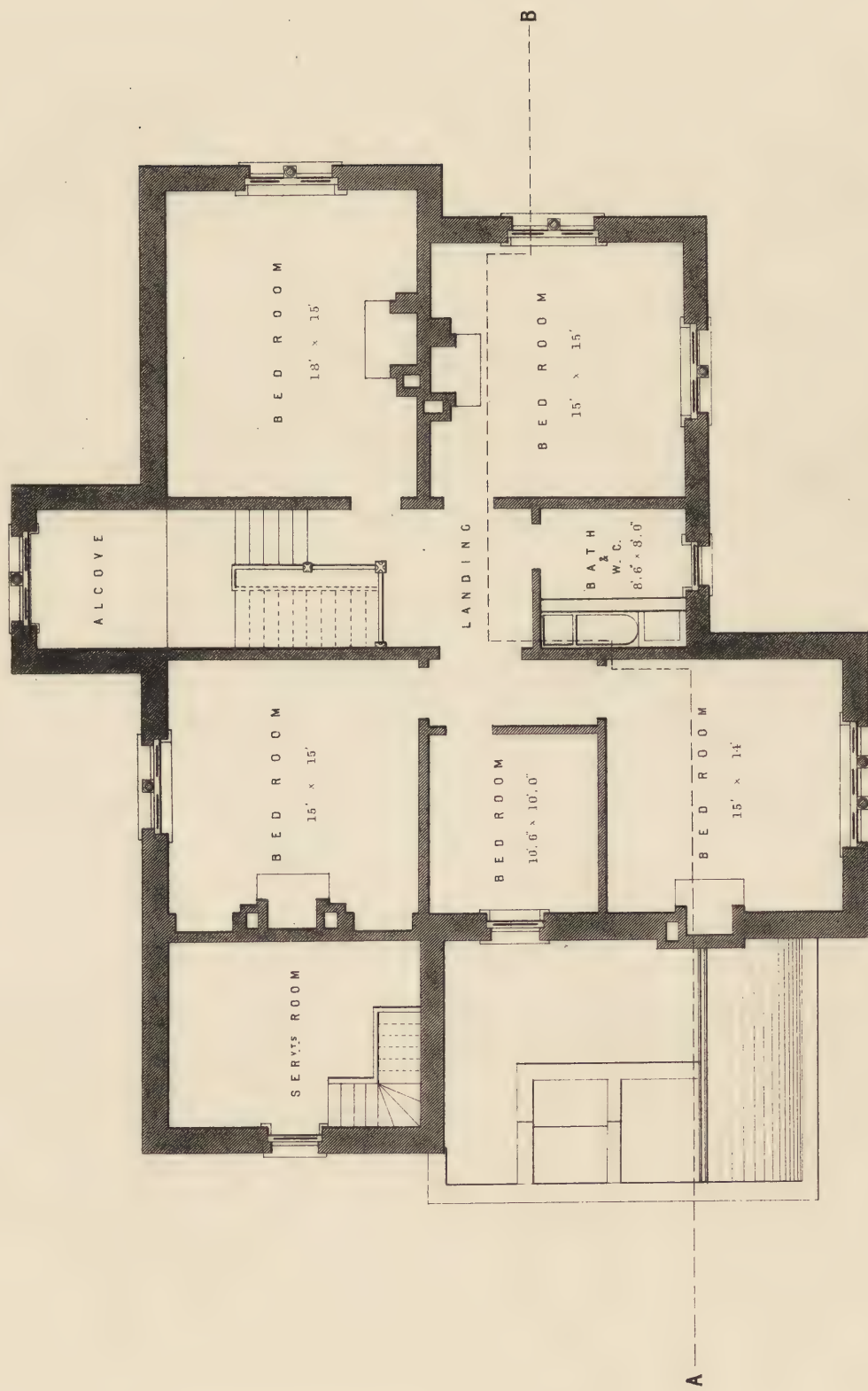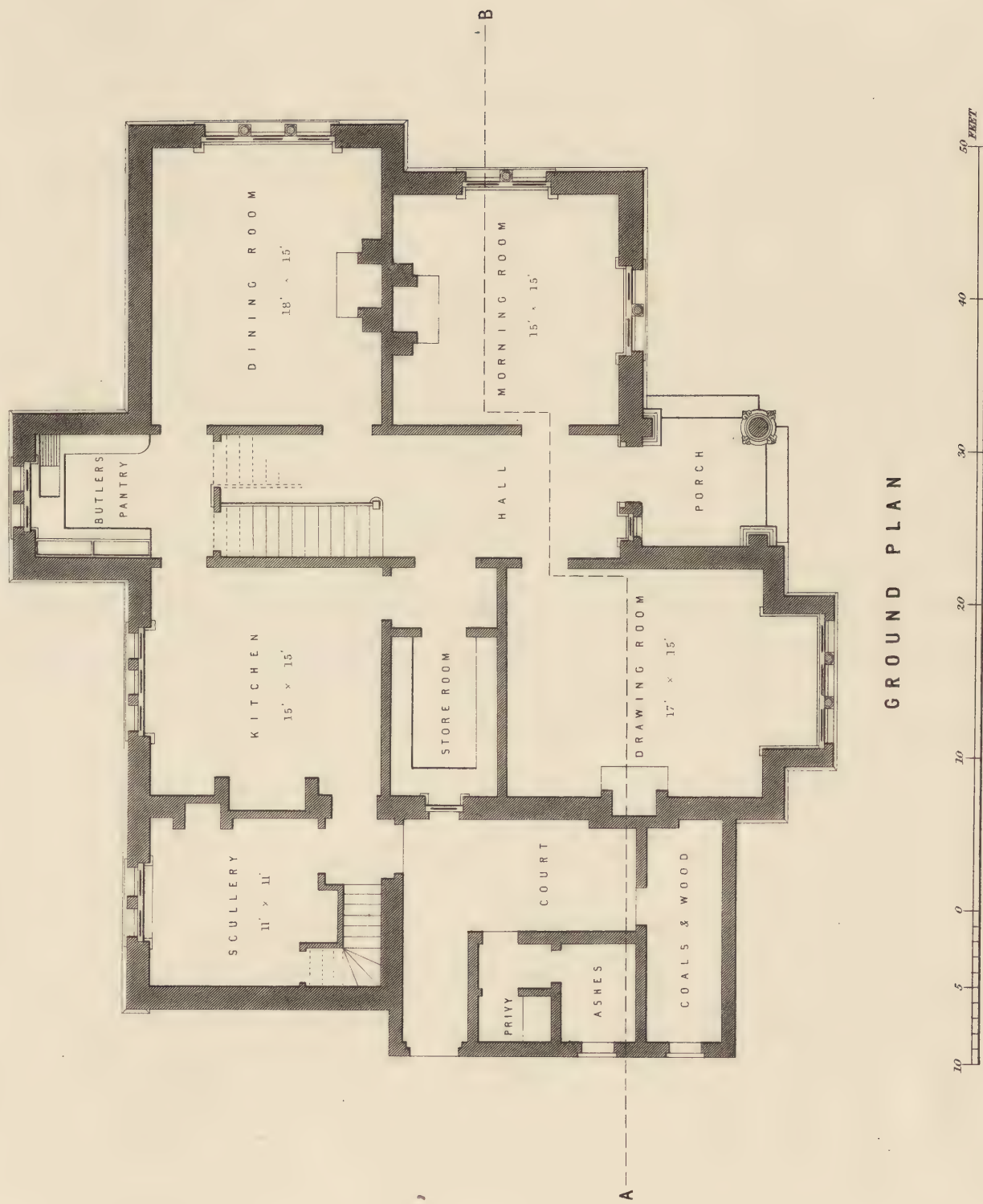
GOTHIC VILLA

ALCOVE

BED ROOM
18' × 15'

BED ROOM
15' × 15'

BED ROOM
15' × 15'

BED ROOM
10·6' × 10·0'

BED ROOM
15' × 14'

LANDING

BATH
&
W. C.
8·6' × 8·0'

SERVTS ROOM

A

B

BEDROOM PLAN

WILLIAM MACKENZIE, GLASGOW, EDINBURGH & LONDON.

10   5   0   10   20   30   40   50 FEET

GOTHIC VILLA

DINING ROOM
18' × 15'

BUTLERS PANTRY

MORNING ROOM
15' × 15'

B

HALL

PORCH

KITCHEN
15' × 15'

STORE ROOM

DRAWING ROOM
17' × 15'

SCULLERY
11' × 11'

COURT

PRIVY

ASHES

COALS & WOOD

A

GROUND PLAN

WILLIAM MACKENZIE, GLASGOW, EDINBURGH & LONDON.

50 FEET 40 30 20 10 0 5 10

FRONT ELEVATION

10 5 0 10 20 30 40 50 FEET

GOTHIC VILLA

SIDE ELEVATION

10   5   0   10   20   30   40   50 FEET

GOTHIC VILLA

SECTION AT A.B.

5   0   10   20   30   40   50 FEET

GOTHIC VILLA
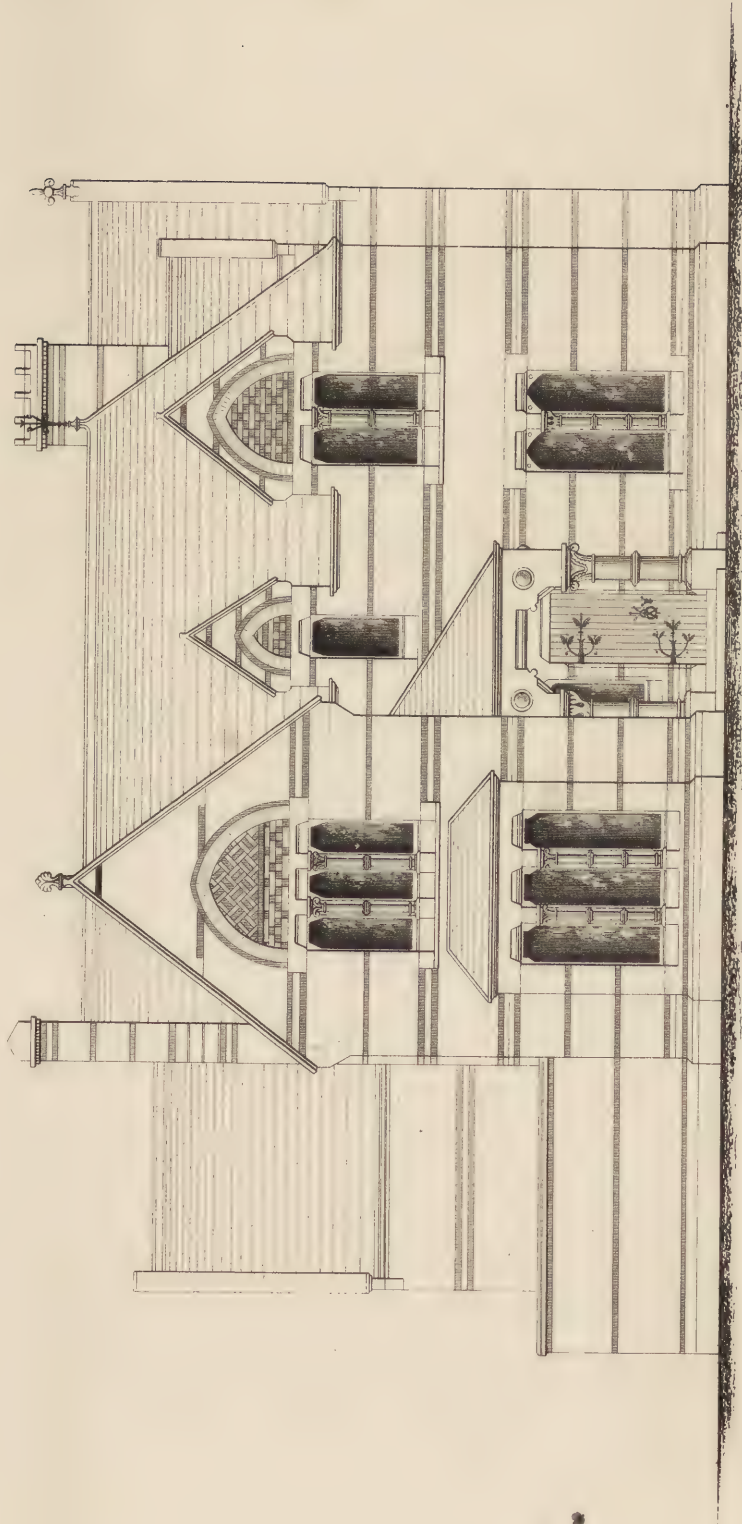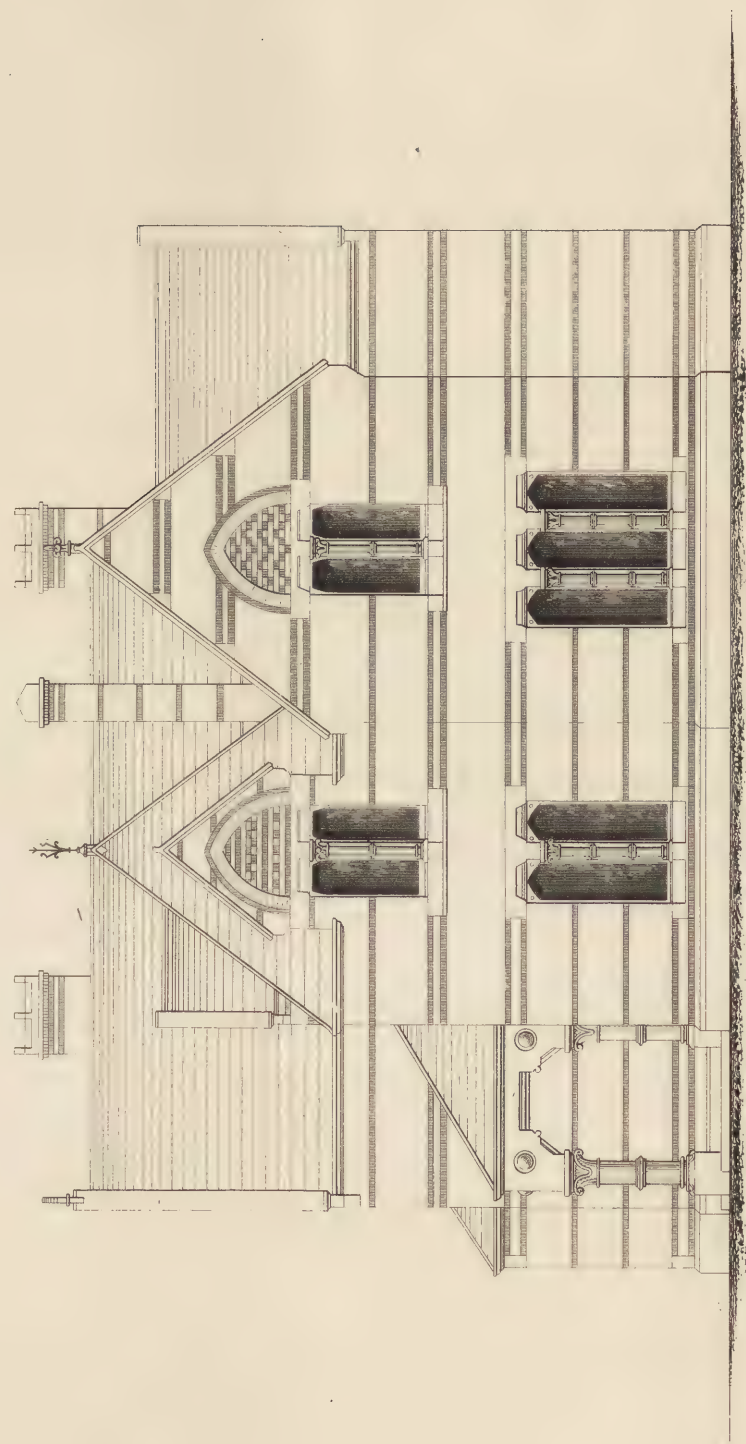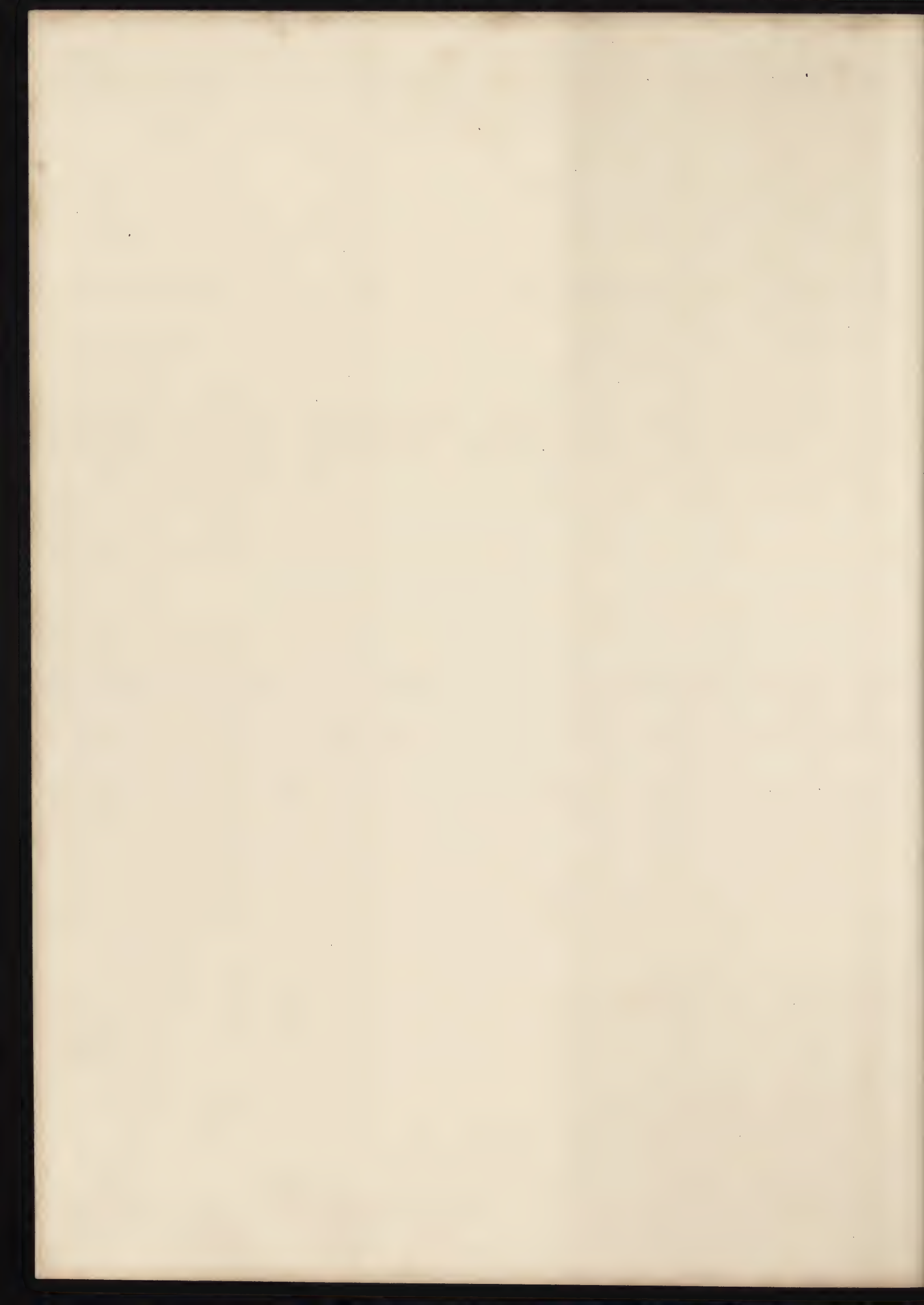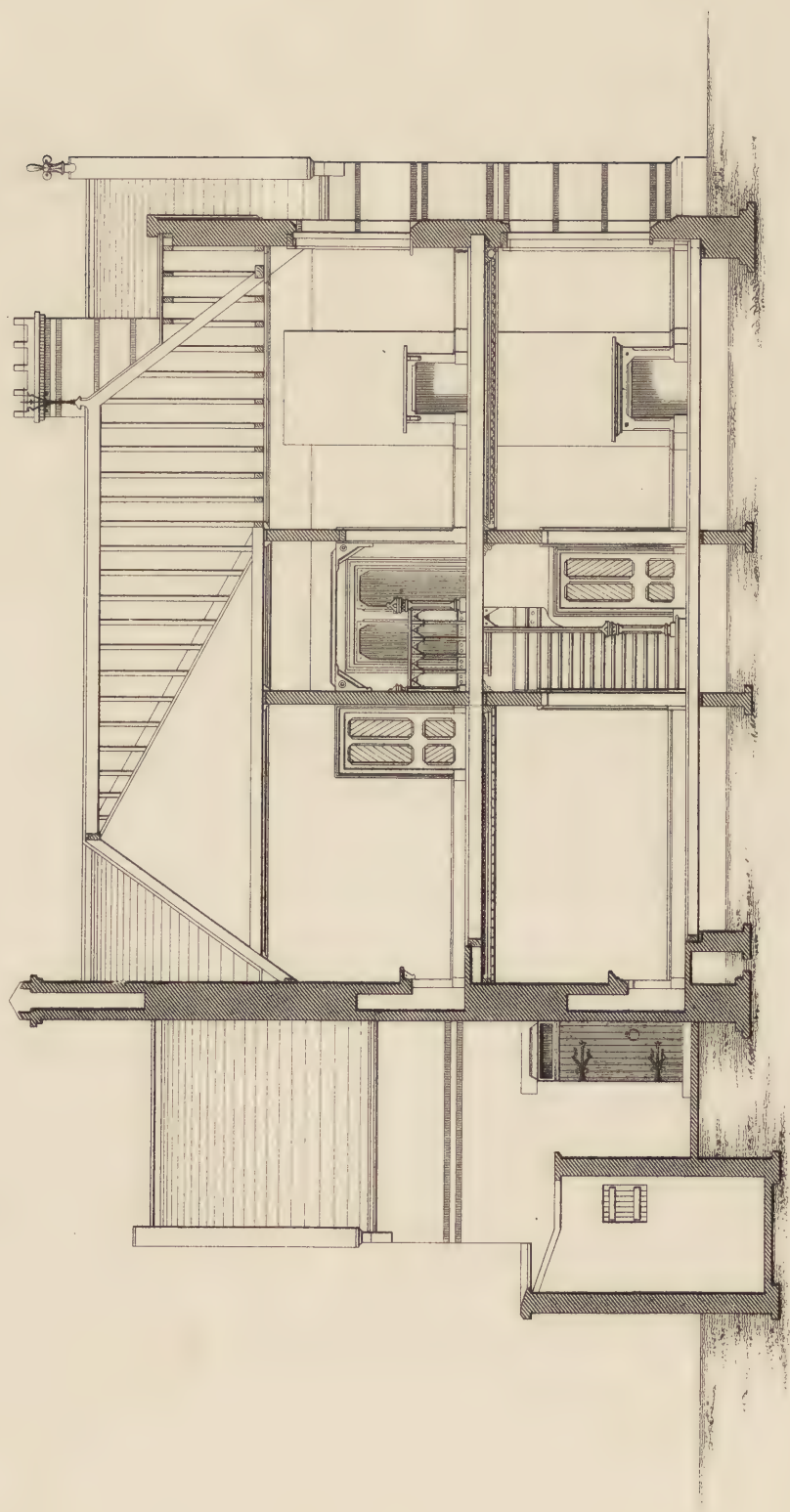
PLAN of ROOF

WILLIAM MACKENZIE. GLASGOW. EDINBURGH & LONDON.
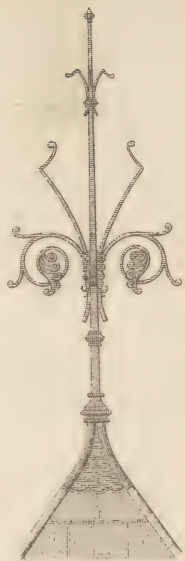
DETAILS.

ROOF
TERMINAL.
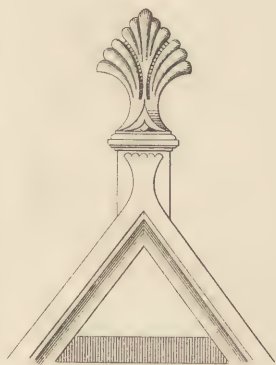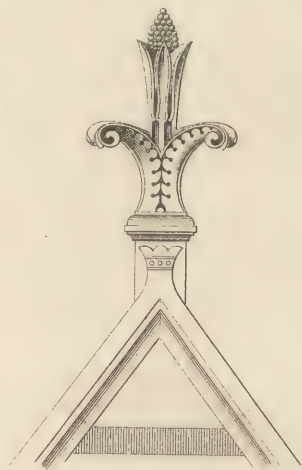
GABLE
TERMINALS.

ENTRANCE PORCH.

INS 12 6 0 1 2 3 4 5 6 7 8 9 FEET

DETAILS.

STAIRCASE.
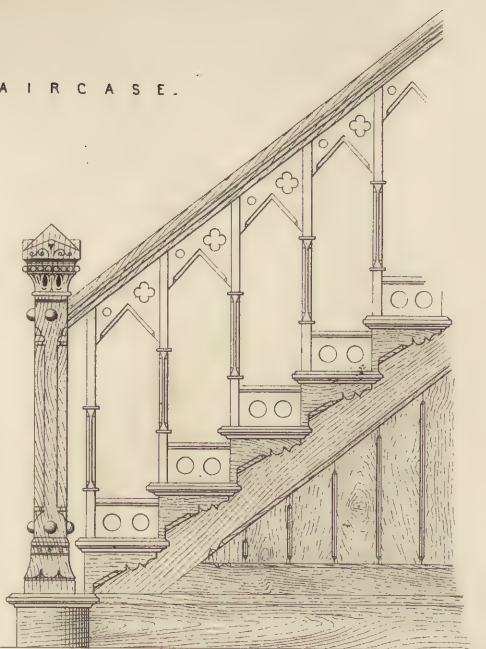
BRACKET OF BEAM
OVER STAIRCASE.

WINDOW IN FRONT GABLE.

BAY WINDOW.

INS 12 6 0 1 2 3 4 5 6 7 8 9 FEET
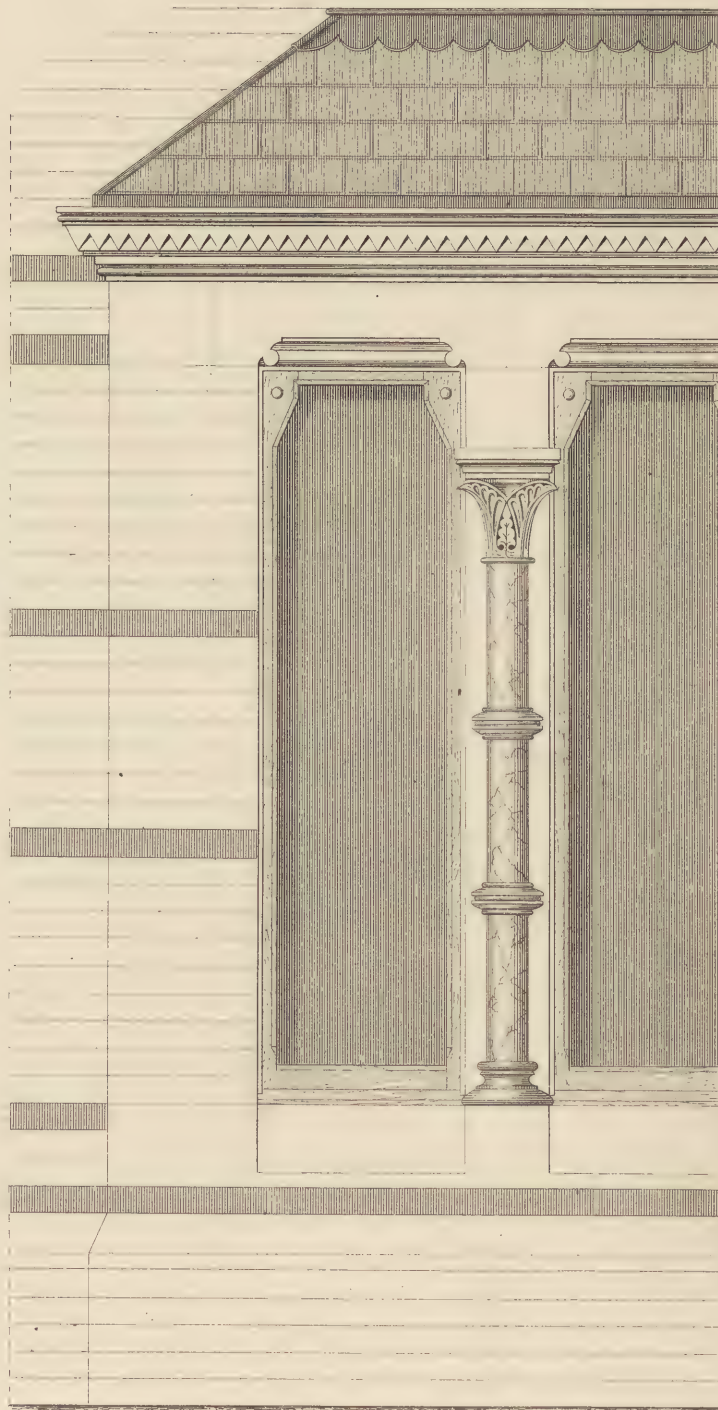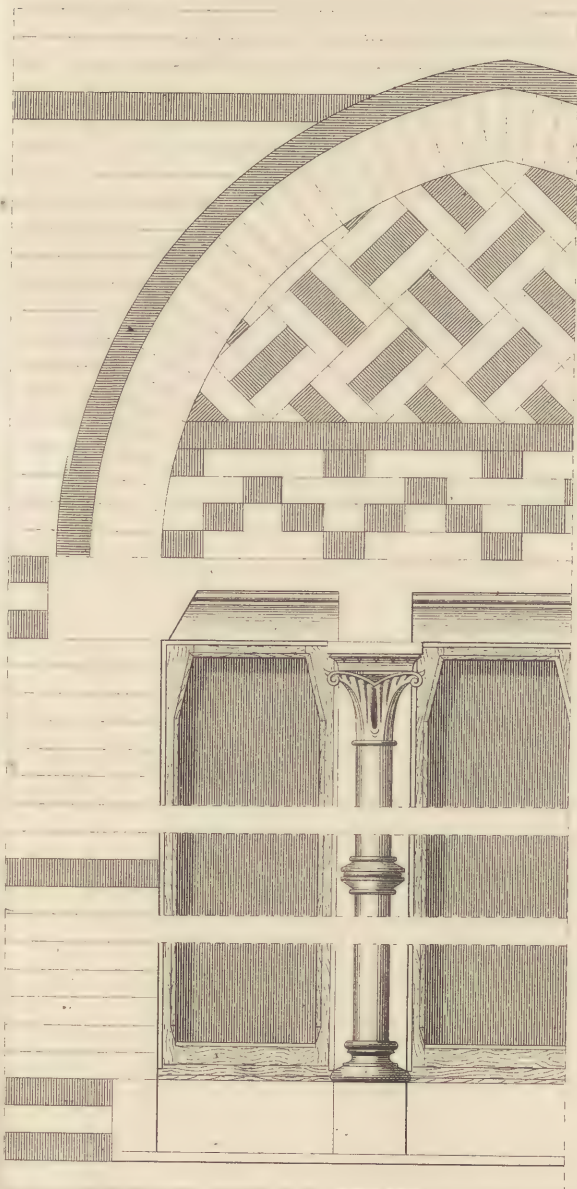
PLATES $\frac{b}{1}$ — $\frac{b}{6}$.

DESIGN FOR A GOTHIC VILLA.

PLATES $\frac{b}{1}$ — $\frac{b}{6}$ contain a design for a Villa in the Gothic Style, illustrated by a Ground Plan, Bedroom Plan, Front Elevation, Side Elevation, Section, and Roof Plan. The Villa is to be built of brick, the walls being faced with selected grey stock, or pressed red brick, with bands, &c., of black brick, as shewn on the drawings of the Elevations. The projecting porch, the steps and lintels of the doors, the weathering of base course, the sills, lintels, and small columns of the windows, the coping of yard wall, the spur-stones, factables, and terminals of gables and dormer windows, and the chimney cappings, to be of stone.

The angle column, and the four raised circular studs in the upper portion of porch, to be of polished granite or marble.

The windows to be filled with plate glass in frames, with shaped heads, as shewn on the Elevations, and made to open inwards. Sashes may be adopted if preferred.

The outside doors to be hung with ornamental wrought-iron hinges.

The roofs to be covered with blue and green slates in bands, or a good effect can be secured with green slates only. An ornamental ridging may be added if desired.

PLATES $\frac{b}{1}$ — $\frac{b}{2}$.—GROUND PLAN,—On the Ground Floor there are three reception rooms, a kitchen, scullery, butler's pantry, and store-room. The dining-room, which measures 18 feet by 15 feet, communicates with the kitchen through the butler's pantry. The drawing-room measures 17 feet by 15 feet, exclusive of the projecting window, which is 8 feet 6 inches by 4 feet; and the morning room is 15 feet square. The kitchen measures 15 feet square, and the scullery adjoining 11 feet square. The store-room opens off the small lobby between the hall and kitchen. The butler's pantry is fitted up with sink, shelves, and cupboards complete. The door to the wine and beer cellars is situated under the stairs, and opens from the pantry.

A coal and wood house, ash-pit, and privy are provided in outbuildings in the court.

DESIGN FOR A GOTHIC VILLA.

The height of the Ground Floor is 11 feet.

BEDROOM PLAN.—On the first floor there are five good bedrooms, a servants' bedroom, and a bathroom and water-closet. The bedrooms measure respectively 18 feet by 15 feet; 15 feet by 15 feet; 15 feet by 15 feet; 15 feet by 14 feet; and 10 feet 6 inches by 10 feet. The bathroom is 8 feet 6 inches by 8 feet.

The small alcove off the first landing of the stairs, may be made a pretty feature in the interior of the house by being used for stands of flowers and other ornamental objects.

The height of the Bedroom Floor is 11 feet.

PLATES $\frac{b}{3}$ — $\frac{b}{4}$.—**FRONT AND SIDE ELEVATIONS.**—On the Elevations the manner of disposing the black brick in bands and in the arches and tympani of the First Floor windows, is shewn by the dark portions. The arches, tympani, and lintels of the windows are flush with the walls. The sills of the upper windows project slightly, so as to throw the water clear of the brick-work under. The small columns in the windows should be of granite, marble, or some dark-coloured stone, having bases, bands, and capitals of the light stone used in the other parts of the exterior.

PLATES $\frac{b}{5}$ — $\frac{b}{6}$.—**SECTION AND ROOF PLAN.**—The section is cut on the line A—B, through the court, drawing-room, hall, and morning room on the Ground Floor, and through the bedrooms over the drawing and morning rooms, and the main landing on the First Floor. In the centre of the Section, the alcove off the first landing is shewn.
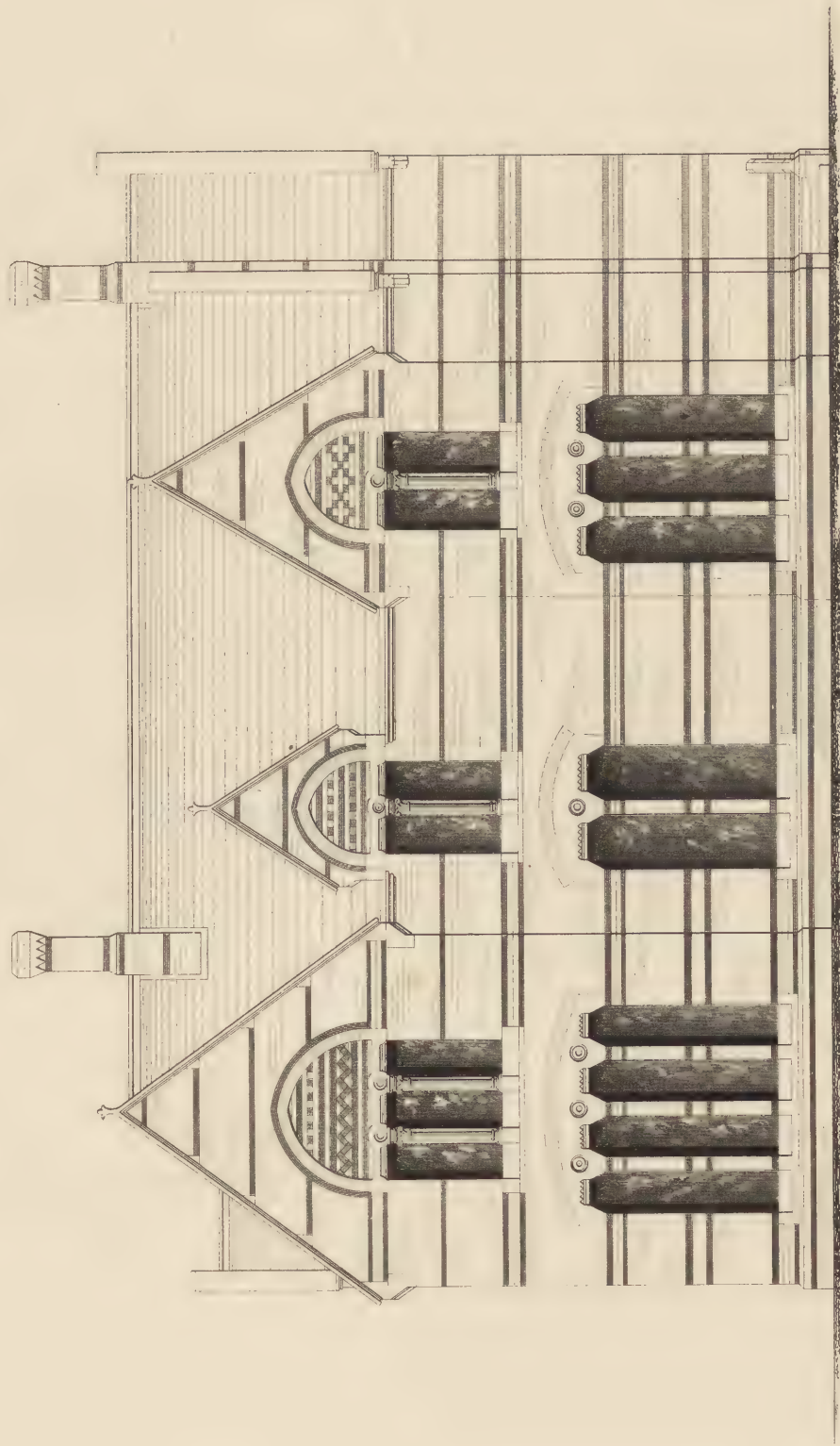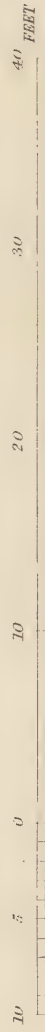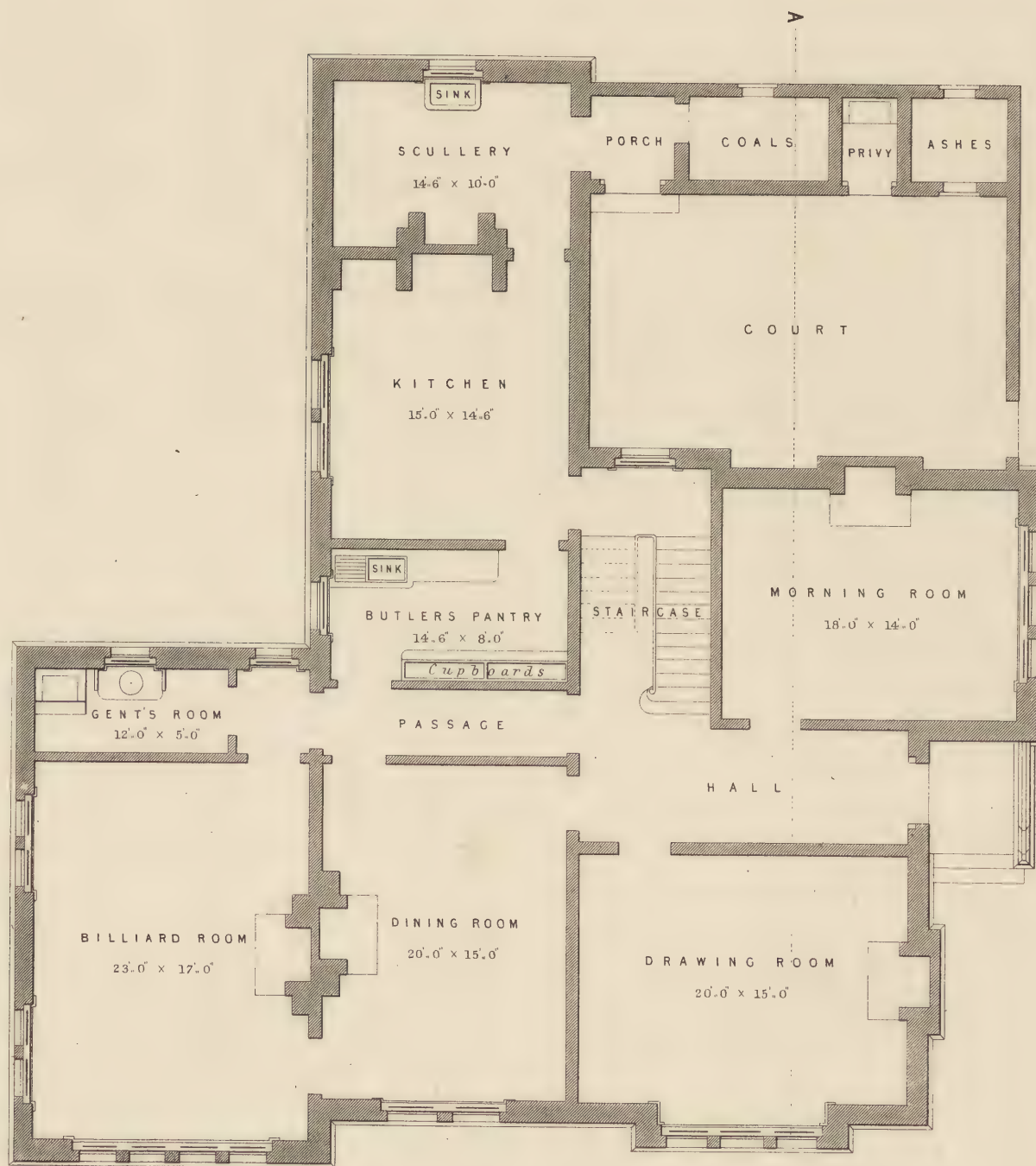
VILLA

FRONT ELEVATION

10   5   0   10   20   30   40 FEET

A

SINK

SCULLERY
14'-6" x 10'-0"

PORCH   COALS   PRIVY   ASHES

COURT

KITCHEN
15'-0" x 14'-6"

SINK

BUTLERS PANTRY
14'-6" x 8'-0"

STAIRCASE

MORNING ROOM
18'-0" x 14'-0"

Cupboards

GENT'S ROOM
12'-0" x 5'-0"

PASSAGE

HALL

BILLIARD ROOM
23'-0" x 17'-0"

DINING ROOM
20'-0" x 15'-0"

DRAWING ROOM
20'-0" x 15'-0"

B

GROUND PLAN

10   5   0   10   20   30   40 FEET

PLATE 3

SIDE ELEVATION

10 5 0 10 20 30 40 FEET

WILLIAM MACKENZIE, GLASGOW, EDINBURGH & LONDON.

VILLA

BED ROOM
18'·0" × 14'·0"

NURSE'S ROOM
14'·6" × 10'·0"

NIGHT NURSERY
14'·6" × 10'·0"

DAY NURSERY
14'·6" × 12'·6"

STAIRCASE

PASSAGE

BATH ROOM & W.C.
12'·6" × 8'·0"

CLOSET

LINEN CLOSET

BED ROOM
17'·6" × 17'·0"

BED ROOM
21'·6" × 15'·0"

LANDING

DRESSING ROOM
11'·6" × 7'·6"

BED ROOM
20'·0" × 15'·0"

A

B

BEDROOM PLAN

40 FEET

30

20

10

0

5

10

ROOF PLAN

10   5   0   10   20   30   40 FEET

SECTION AT A—B

10   5   0   10   20   30   40 FEET

PLATE 7

GOTHIC VILLA
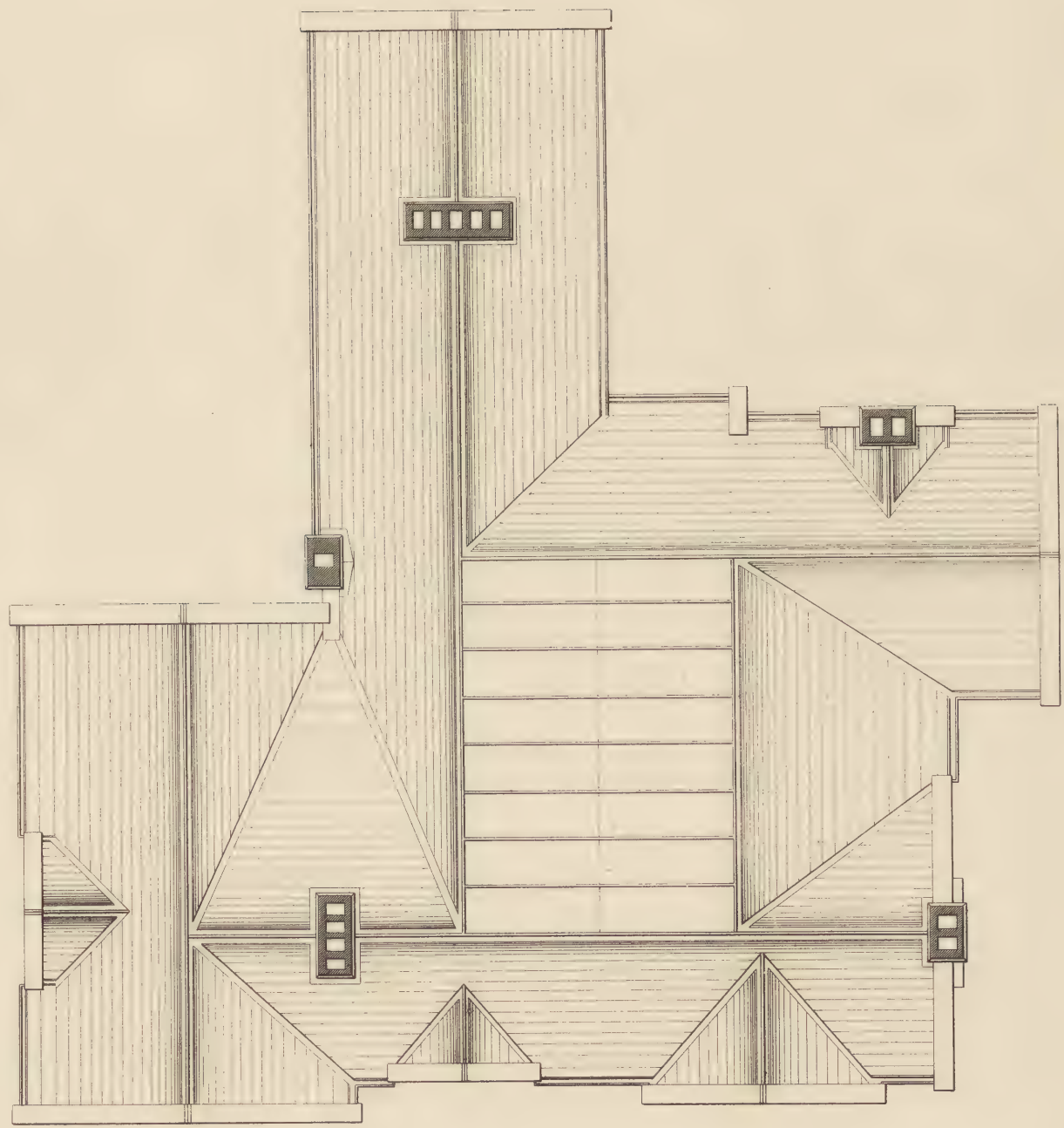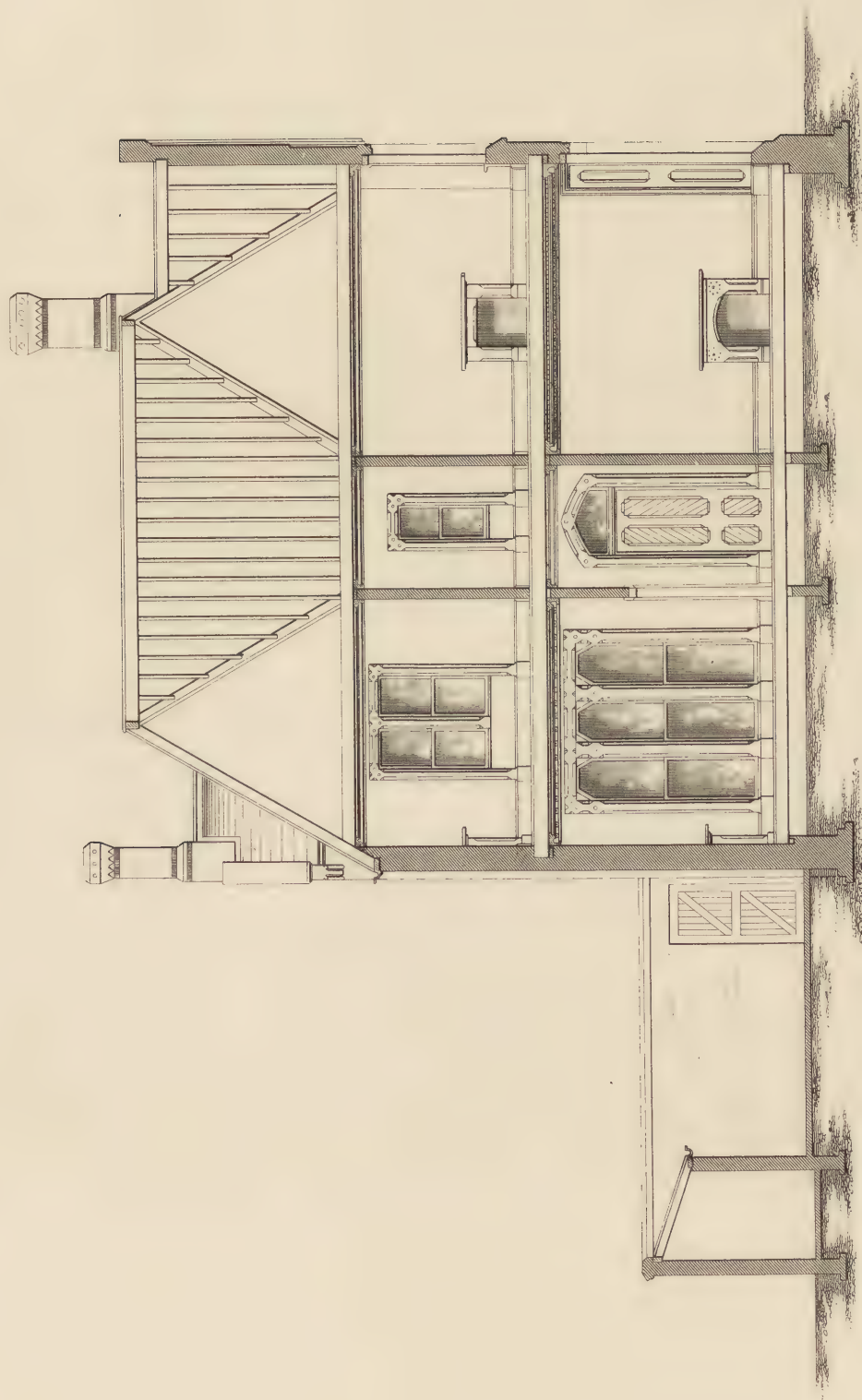
GABLE TERMINATIONS
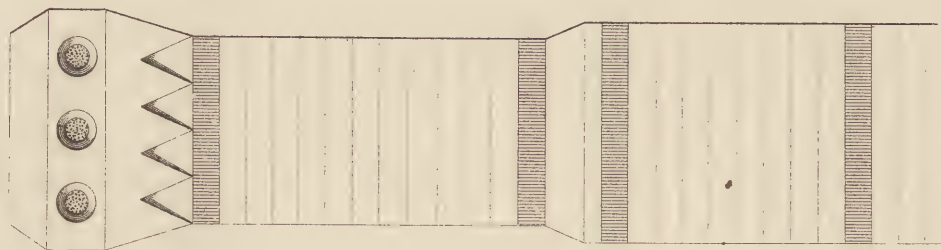
SPUR STONES

CHIMNEY HEADS
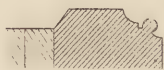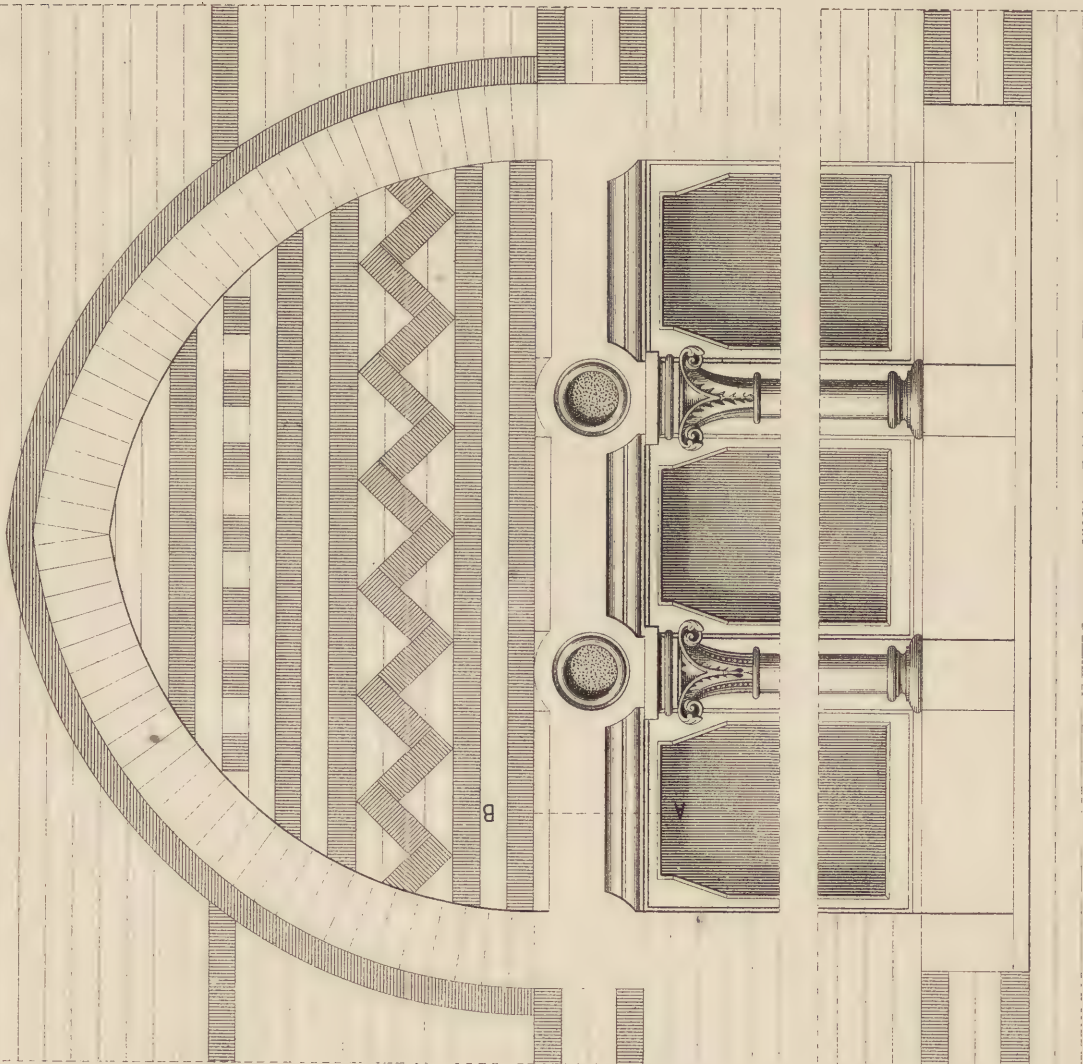
BED ROOM WINDOW, MAIN GABLE

LINTEL AT A–B

INCHES 12 6 0 1 2 3 4 5 6 7 8 9 FEET

PLATE 8

GOTHIC VILLA
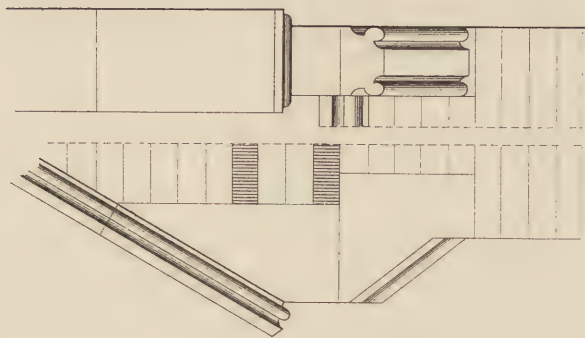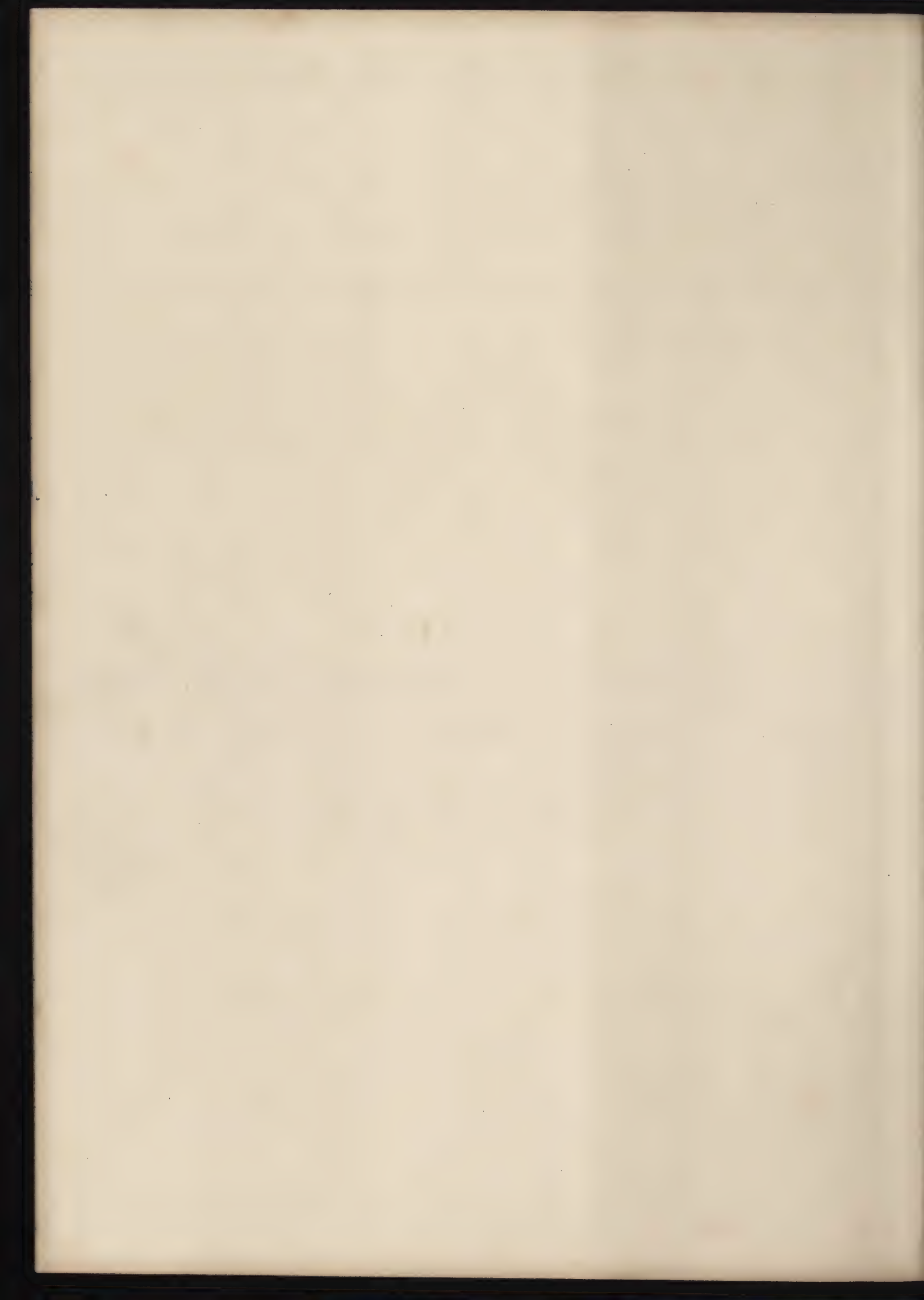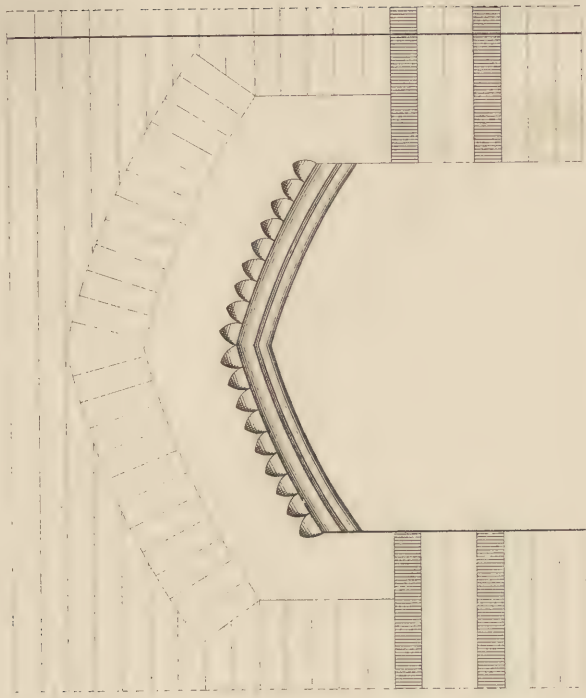
ARCH OF ENTRANCE DOORWAY
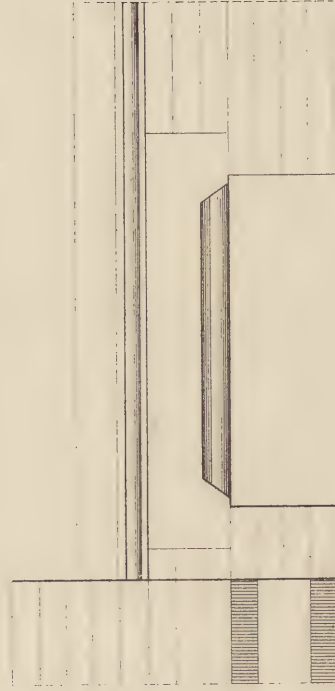
YARD DOOR

DINING ROOM WINDOW

INCHES 12 6 0

1 2 3 4 5 6 7 8 9 FEET
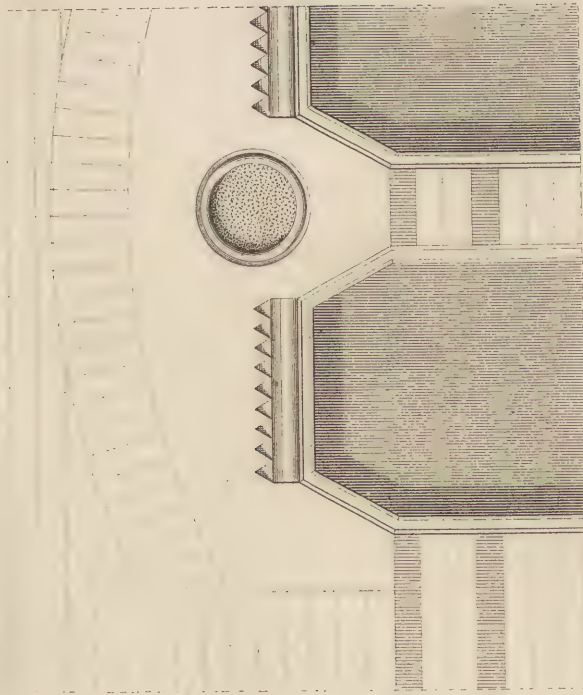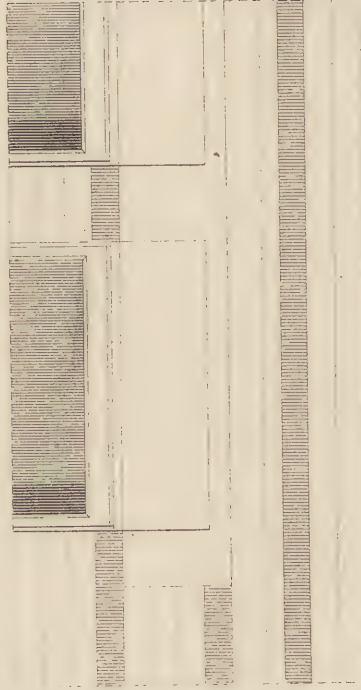
WILLIAM MACKENZIE, GLASGOW, EDINBURGH & LONDON.

PLATES $\frac{c}{1}$ — $\frac{c}{8}$.

DESIGN FOR A VILLA.

PLATES $\frac{c}{1}$ — $\frac{c}{8}$ contain Ground Plan, Bedroom Plan, Front and Side Elevations, Section, Roof Plan, and Details of a commodious Gothic Villa. The general walls are intended to be of red pressed or grey stock bricks, with the bands, arches, and tympani, of rich red and black bricks. If a light-coloured stone is used for the weathering of base-course, steps, &c., of entrance door, sills and lintels of windows and doors, the factables, wall coping, gutter course, chimney heads, &c., a very pleasing and effective exterior will be obtained.

PLATE $\frac{c}{2}$.—GROUND PLAN.—The Ground Plan is conveniently arranged, and contains four large reception rooms, viz., a drawing-room, 20 feet by 15 feet; dining-room, 20 feet by 15 feet; morning-room, 18 feet by 14 feet; and a billiard-room, 23 feet by 17 feet. To these are added a gentlemen's room, situated near the billiard-room and dining-room—it measures 12 feet by 5 feet, and is fitted with a water-closet and wash-basin; a butler's pantry, 14 feet 6 inches by 8 feet, with all the requisite conveniences; a kitchen, 15 feet by 14 feet 6 inches; a scullery, 14 feet 6 inches by 10 feet, opening off the kitchen, and having an external porch; and the necessary offices in the court. The hall, which is 7 feet wide, gives direct access to the drawing-room, dining-room, and morning-room, and to the billiard-room and gentlemen's room by a short passage. The service from the kitchen to the dining-room is through the butler's pantry, and across the small passage. The staircase is 8 feet wide, the window of which, with the large fanlight over the entrance door, gives light to the hall.

The height of the Ground Floor is 13 feet.

PLATE $\frac{c}{1}$.—The Front Elevation shews the windows of the drawing-room, dining-room, and billiard-room, and those of the respective bedrooms over.

DESIGN FOR A VILLA.

PLATE $\frac{c}{4}$.—BEDROOM PLAN.—On the First Floor there are four large bedrooms, a dressing-room off the bedroom over the drawing-room, a day-nursery, night-nursery, and nurse's or servants' bedroom. There are also a bath-room and water-closet, and a linen-closet. All the bedrooms have fire-places, and are well lighted.

The height of the Bedroom Floor is 10 feet.

PLATE $\frac{c}{3}$.—The Side Elevation shews the entrance doorway, the windows of the morning-room and the bedroom over, and the court wall and gate.

PLATES $\frac{c}{5}$ — $\frac{c}{6}$ shew Roof Plan and Section. The Section is cut on the line A—B through the morning-room, hall, and drawing-room on the Ground Floor, and through the respective bedrooms and dressing-room over.

PLATES $\frac{c}{7}$ — $\frac{c}{8}$ contain Details of the more important part of the villa, viz., the bed-room window in main gable of the Front Elevation, the head and sill of dining-room window, the arch of entrance doorway, the gable terminations and spur stones, the wall coping of the yard and the lintel of the doorway in same. With these no difficulty will be experienced in developing all the Details of the villa.

PRIVY

ASHES

COALS

SCULLERY

Sink

COURT

LARDER

KITCHEN

16'. 0" × 14'. 6"

Cupboards

BUTLERS PANTRY

PARLOR

12'. 0" × 11'. 6"

DRAWING ROOM

18'. 0" × 15'. 6"

A

DINING ROOM

19'. 0" × 14'. 6"

B

HALL

STAIRCASE

PORCH

GROUND PLAN

10   5   0   10   20   30   40 FEET

BED ROOM

15'. 9" × 14'. 6"

CLOSET

BED ROOM

12'. 0" × 11'. 6"

PASSAGE

BATH ROOM

A

BED ROOM

18'. 0" × 15'. 6"

BED ROOM

19'. 0" × 14'. 6"

B

LANDING

STAIRCASE

BEDROOM PLAN

10   5   0   10   20   30   40   FEET

GOTHIC COTTAGE

ELEVATION

10   5   0   10   20   30   40   50 FEET
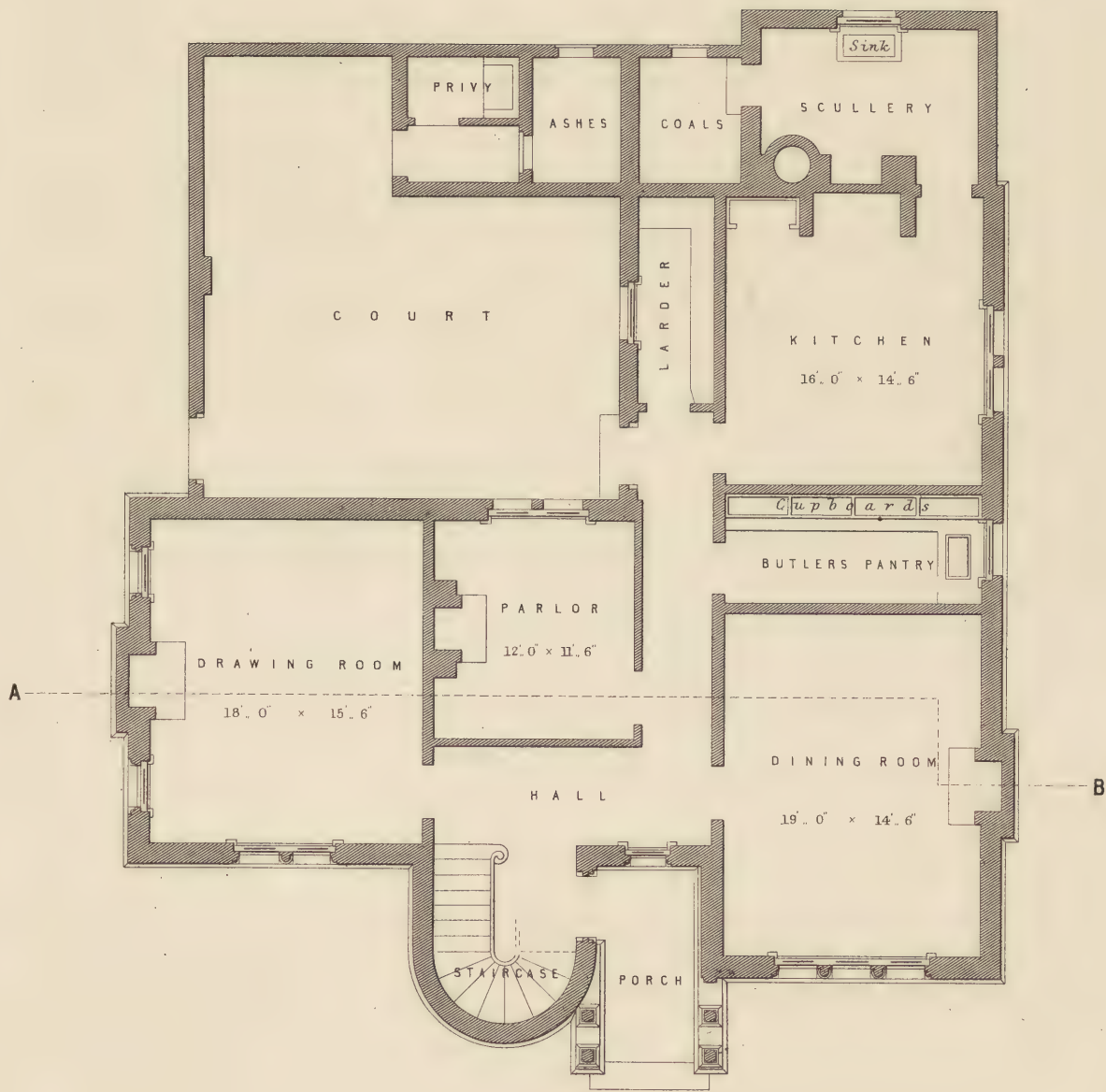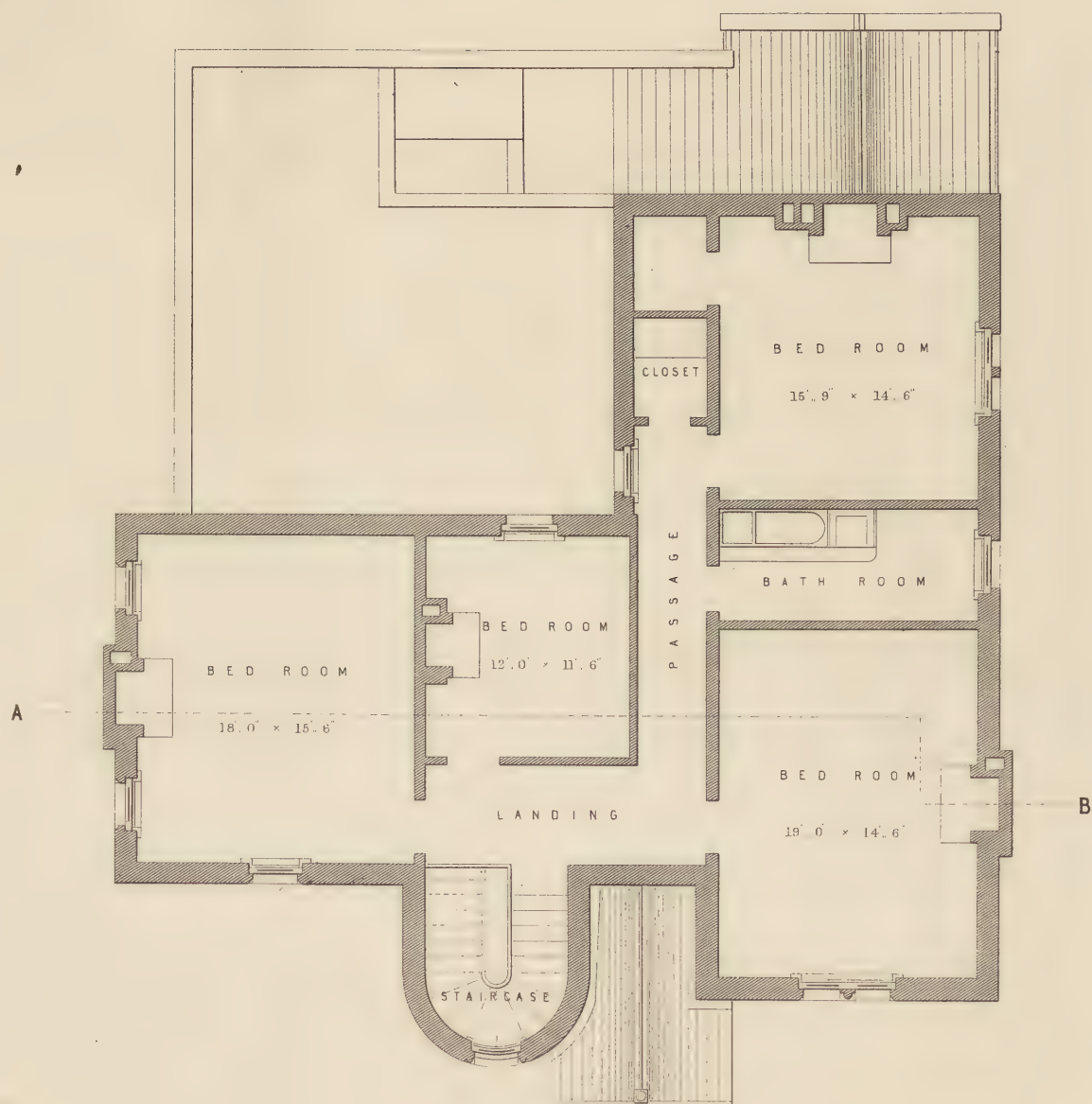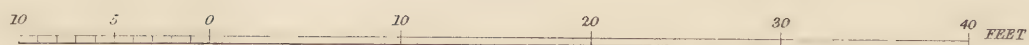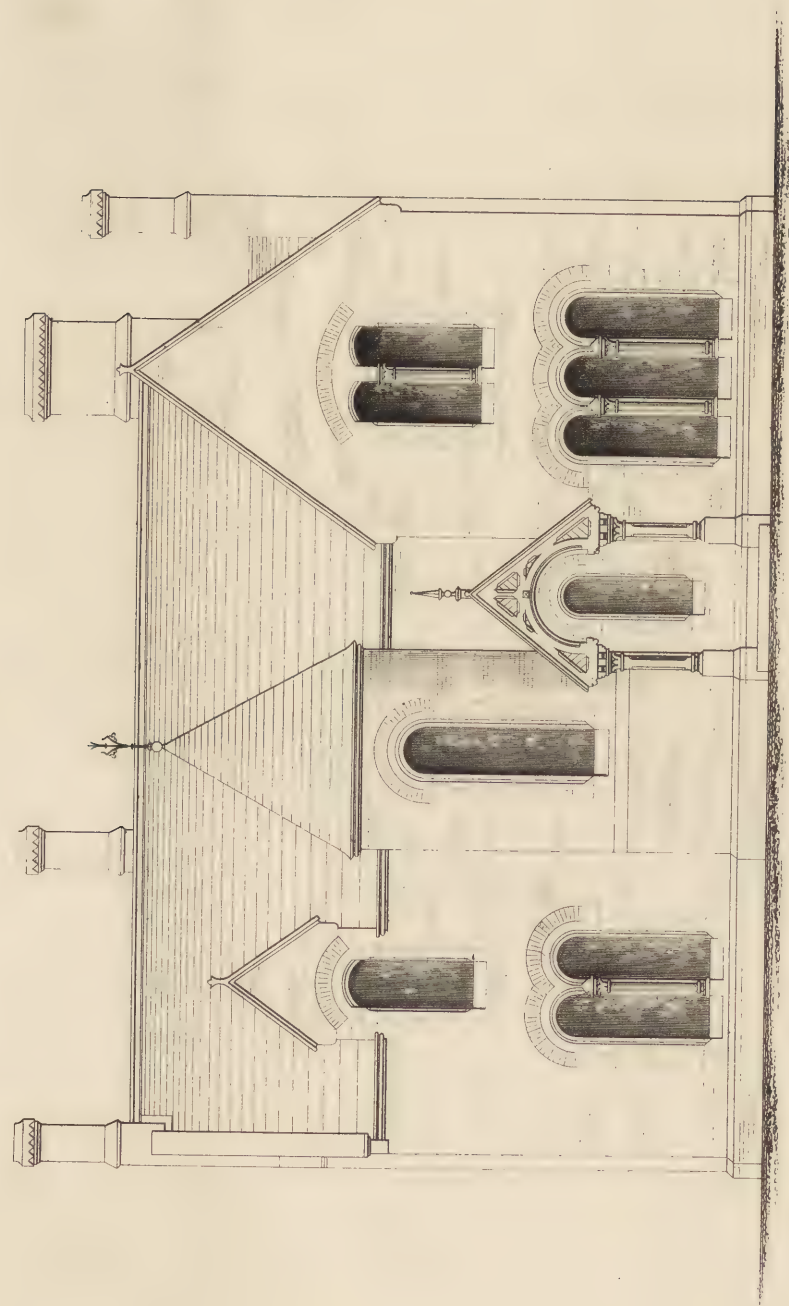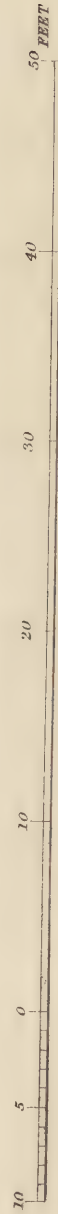
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SECTION AT A. B.

10   5   0   10   20   30   40   50 FEET
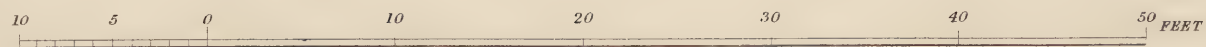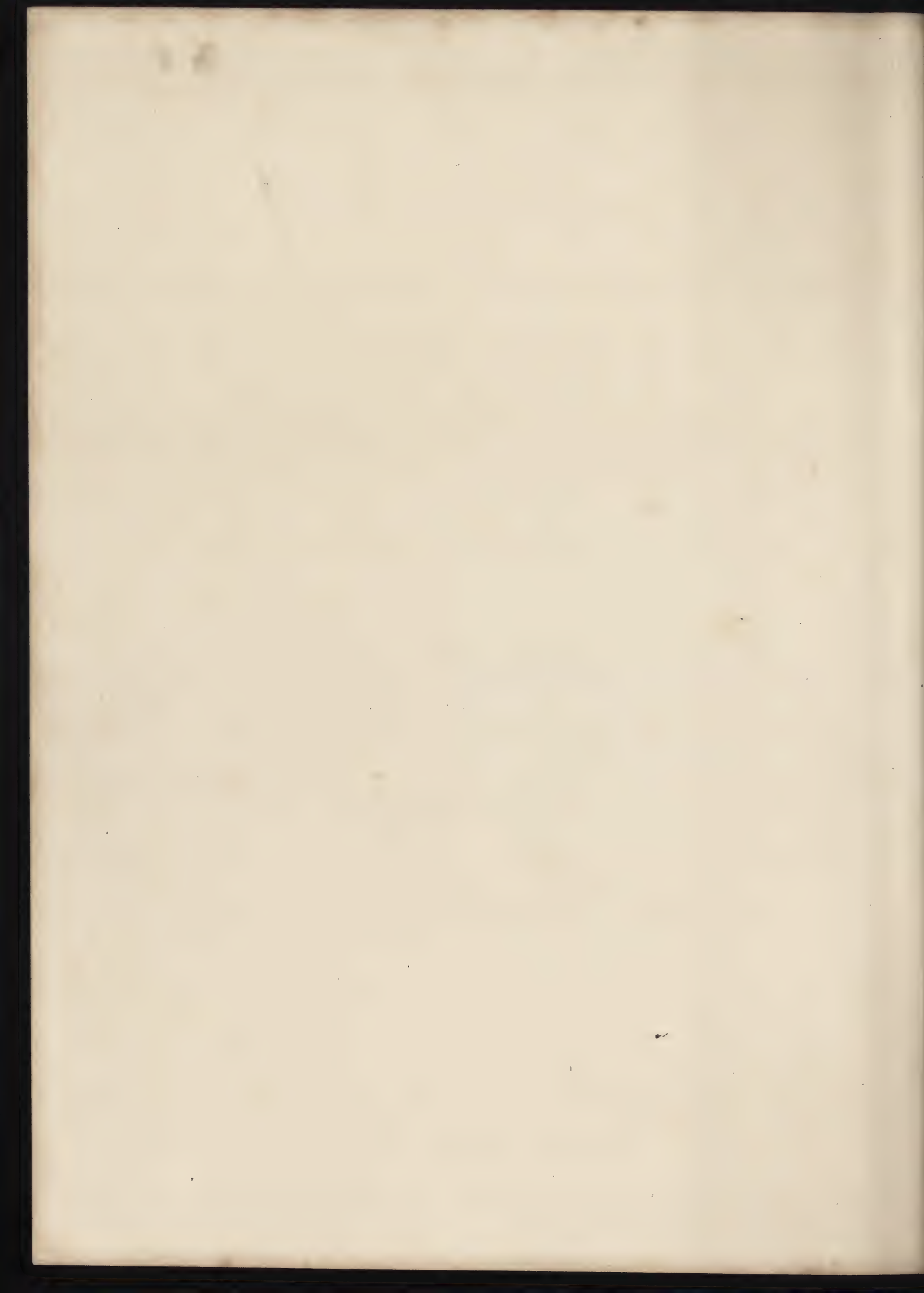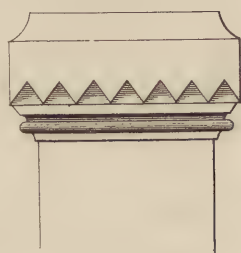
CHIMNEY

SIDE OF PORCH

FRONT ENTRANCE PORCH

INS 12 6 0 1 2 3 4 5 6 7 8 9 FEET

GOTHIC COTTAGE

DETAILS

BOARDED CEILING
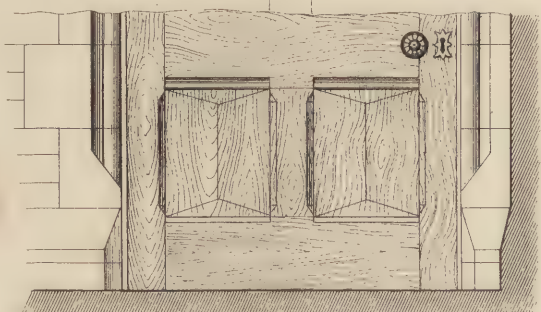
FRONT DOORWAY

DORMER WINDOW

DRAWING ROOM WINDOW

INS 12 6 0   1   2   3   4   5   6   7   8   9 FEET
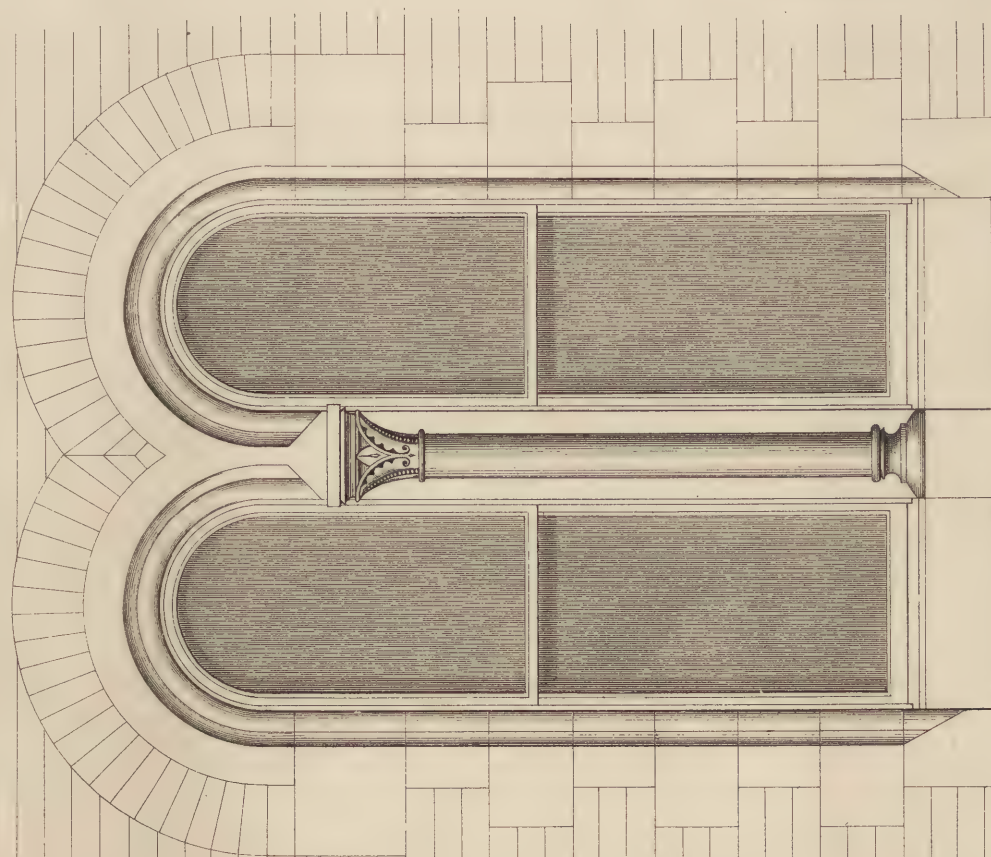
PLATES $\frac{d}{1}$ — $\frac{d}{4}$.

DESIGN FOR A COTTAGE.

PLATES $\frac{d}{1}$ — $\frac{d}{4}$ contain Ground Plan, Bedroom Plan, Elevation, and Section of a Cottage in the Gothic Style. The round arch has been adopted for the doors and windows, to give a distinct character to this design. The drawings shew the cottage to be built of brick with stone finishings, and the arches have relieving arches, which, should the general walls be executed in ordinary brick, may be inserted in patent pressed brick. The design may be executed in stone throughout, if the walls are made a few inches thicker and with dressed quoins to all angles. The projecting porch to be constructed of stone up to the top of the capitals of the supports, all above being of woodwork stained and varnished. The roofs may be covered with plain or ornamental slates, the staircase having a wrought iron finial as shewn.

PLATE $\frac{d}{1}$.—GROUND PLAN.—On the Ground Floor there are three reception rooms opening conveniently from the hall, a kitchen, scullery, butler's pantry, and larder. The dining-room measures 19 feet by 14 feet 6 inches, and is placed in close proximity to the butler's pantry and kitchen. The drawing-room, opening from the opposite end of the hall, measures 18 feet by 15 feet 6 inches, and is lighted by three windows. The parlour measures 12 feet by 11 feet 6 inches; the kitchen, 16 feet by 14 feet 6 inches; the butler's pantry, 14 feet 6 inches by 6 feet; and the scullery, 12 feet by 7 feet. The butler's pantry is fitted with cupboards, dresser, and sink, and the scullery has a fireplace, boiler, and sink complete. The entrance doorway, protected by the porch, opens into the projecting portion of the building, which contains the staircase. This will be found a convenient arrangement, as it leaves the hall complete in itself; the latter is lighted by both the staircase and porch windows. Kitchen offices are provided in the court, the coal-cellar having an entrance from the scullery.

The height of the Ground Floor is 11 feet.

DESIGN FOR A COTTAGE.

PLATE $\frac{d}{2}$.—BEDROOM PLAN.—On the Bedroom Floor there are four bedrooms, a bath-room and water-closet, and a linen closet. The bedrooms measure respectively 19 feet by 14 feet 6 inches; 18 feet by 15 feet 6 inches; 15 feet 9 inches by 14 feet 6 inches; and 12 feet by 11 feet 6 inches. All the bedrooms are well lighted, and are furnished with fire-places.

The height of the Bedroom Floor is 10 feet.

PLATES $\frac{d}{3}$ and $\frac{d}{4}$ contain Front Elevation and Section. The Elevation shews the porch and staircase, the windows of dining-room, drawing-room, and respective bedrooms over, and those of the hall and staircase.

The Section is cut on the line A—B through the drawing-room, parlour, and dining-room on the Ground Floor, and the three bedrooms over.
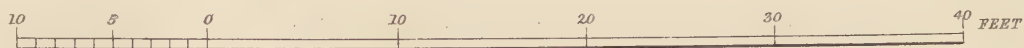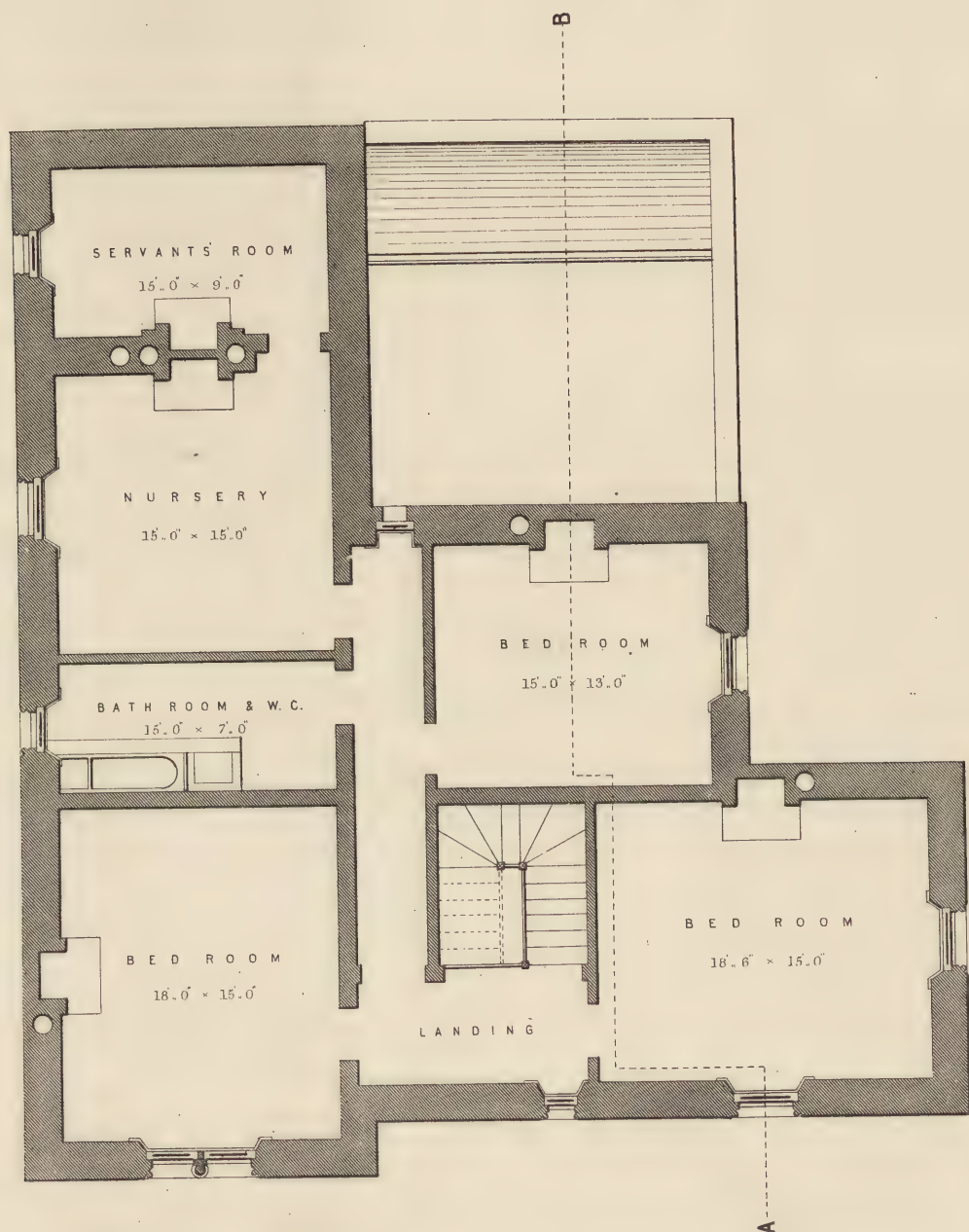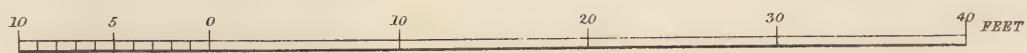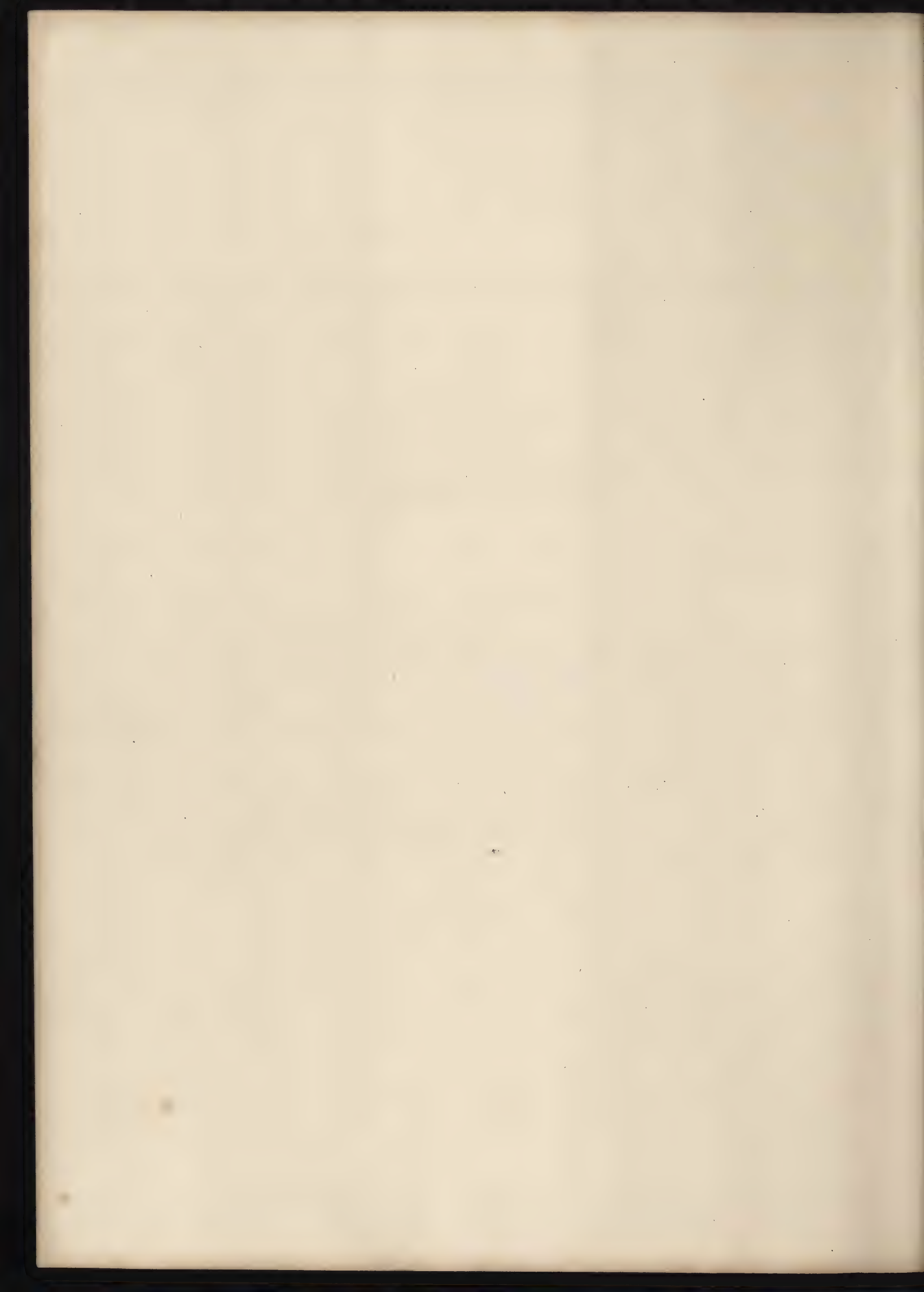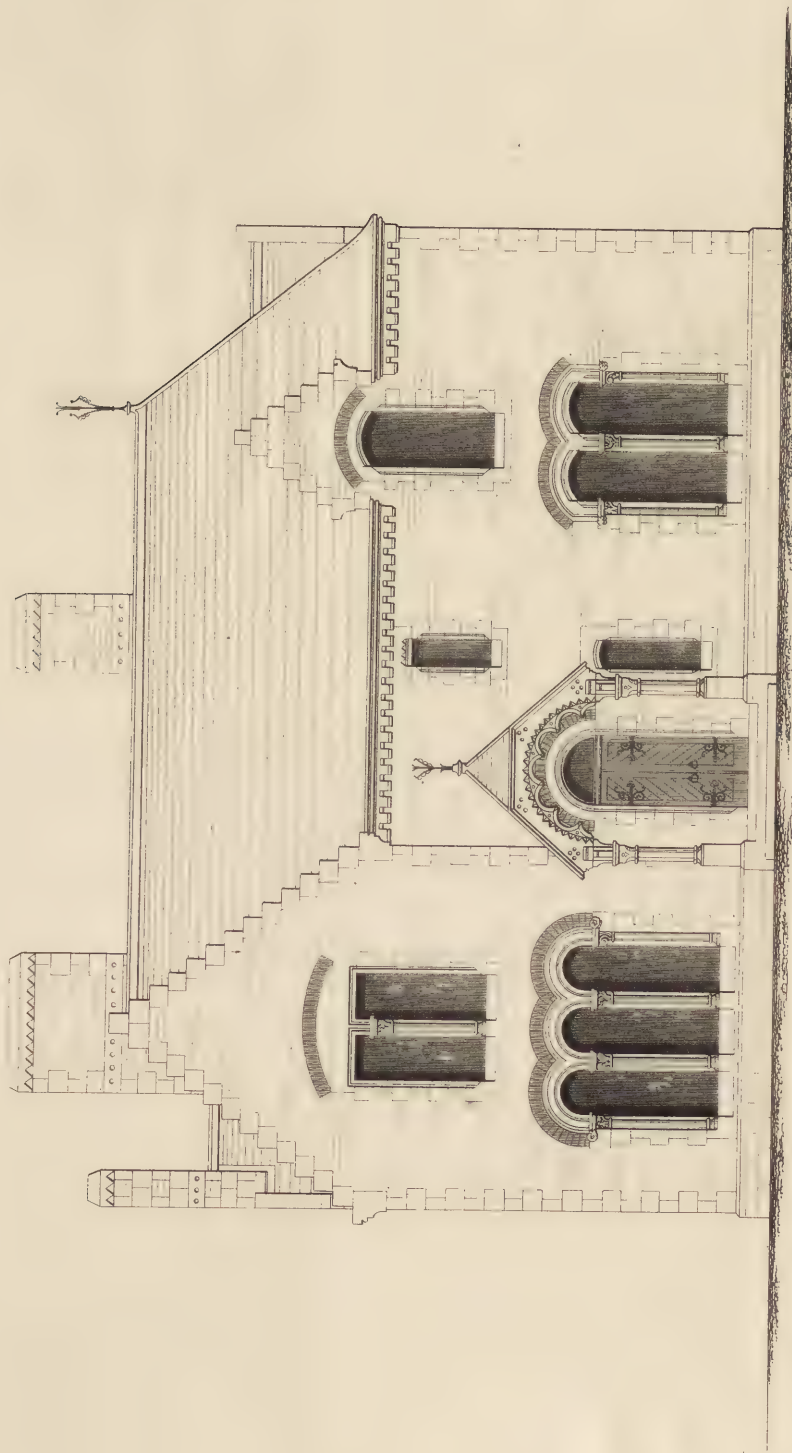
B

CLOSET

COALS

ASHES

PRIVY

SCULLERY
10'.6" × 9'.0"

COURT

KITCHEN
16'.0" × 15'.0"

PANTRY

MORNING ROOM
15'.0" × 13'.0"

BUTLERS
PANTRY
10'.6" × 7'.0"

Cupboards

DRAWING ROOM
18'.6" × 15'.0"

DINING ROOM
18'.0" × 15'.0"

HALL

A

GROUND PLAN

10   5   0   10   20   30   40 FEET

B

SERVANTS' ROOM
15'.0" × 9'.0"

NURSERY
15'.0" × 15'.0"

BED ROOM
15'.0" × 13'.0"

BATH ROOM & W.C.
15'.0" × 7'.0"

BED ROOM
18'.0" × 15'.0"

BED ROOM
18'.6" × 15'.0"

LANDING

A

BED ROOM PLAN

| 10 | 5 | 0 | 10 | 20 | 30 | 40 FEET |

FRONT ELEVATION
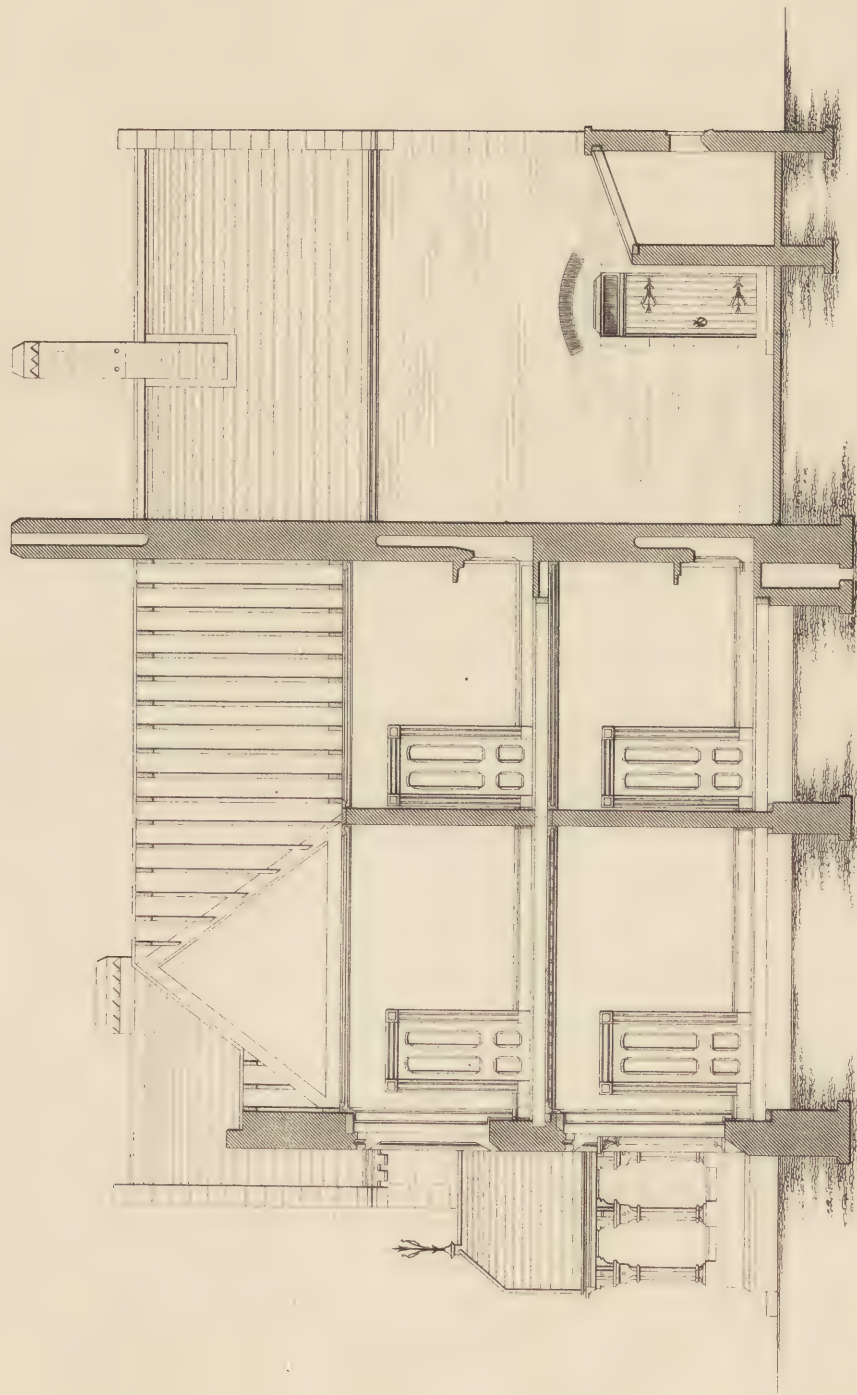
WILLIAM MACKENZIE, GLASGOW, EDINBURGH & LONDON.

FEET
10   5   0   10   20   30   40

PLATE 4

SECTION AT A—B

PLATES $\frac{e}{1}$ — $\frac{e}{4}$.

DESIGN FOR A COTTAGE.

PLATES $\frac{e}{1}$ — $\frac{e}{4}$ contain a Design for a cottage or small villa, illustrated by a Ground Plan, Bedroom Plan, Front Elevation, and Section. The drawings shew the cottage to be built of stone, which should be of two or three colours; light tinted being selected for the dressed portions, blue or grey coloured for the rubble work, and red, or other dark coloured, for the arches over the doors and windows, shewn on the Elevation and Section by a light tint.

Red brick may be used for the walls, in which case the quoins on the angles of gables and main walls may or may not be retained, as individual taste may direct; and the eave cornice can be constructed of projecting bricks or of stone, as shewn, with a cast-iron or stone gutter over.

The porch to be constructed of timber, above the level of the dwarf walls on which the columns rest. It may either be painted chocolate and hatched with black and buff, or simply stained and varnished in the usual way. The roofs may be covered with plain or ornamental slating, and to have iron finials as shewn.

PLATE $\frac{e}{1}$.—GROUND PLAN.—On the Ground Floor there are three reception rooms, viz., a dining-room measuring 18 feet by 15 feet; a drawing-room, 18 feet 6 inches by 15 feet; and a morning-room, 15 feet by 13 feet: a kitchen, scullery, butler's pantry, and china closet or lock-up pantry.

The kitchen and butler's pantry are very conveniently placed in close proximity to the dining and morning rooms, as may be seen by reference to the Ground Plan.

A coal-house, ash-pit, and privy are provided in an outbuilding in the court.

The height of the Ground Floor is 11 feet.

PLATE $\frac{e}{2}$.—BEDROOM PLAN.—On the Bedroom Floor there are five rooms and a bath-

room: the latter is fitted with baths and water-closet. The rooms measure respectively 18 feet by 15 feet; 18 feet 6 inches by 15 feet; 15 feet by 15 feet; 15 feet by 13 feet; and 15 feet by 9 feet. All the rooms have fireplaces.

The height of the Bedroom Floor is 10 feet.

PLATES $\frac{e}{3}$ and $\frac{e}{4}$ contain the Front Elevation and Section. The latter is cut on the line A—B, through the drawing-room, morning-room, court, and outbuilding, shewing the side elevation of the entrance porch and kitchen wing; and through the two bed-rooms over the drawing and morning rooms.

A

BED ROOM
16'..0" × 15'..0"

BED ROOM
13'..0" × 11'..6"

B

BED ROOM
16'..0" × 14'..0"

LANDING

BATH
&
W.C.

BED ROOM
17'..6" × 15'..0"

BEDROOM PLAN

A

KITCHEN
16'..0" × 15'..0"

SCULLERY

Sink

COALS

ASHES

PRIVY

COURT

CHINA CLOSET

BUTLERS PANTRY

B

DINING ROOM
18'..0" × 16'..0"

HALL

DRAWING ROOM
17'..0" × 15'..0"

GROUND PLAN

10   5   0   10   20   30   40 FEET

ELEVATION

SECTION at A-B

10   5   0   10   20   30   40   50 FEET
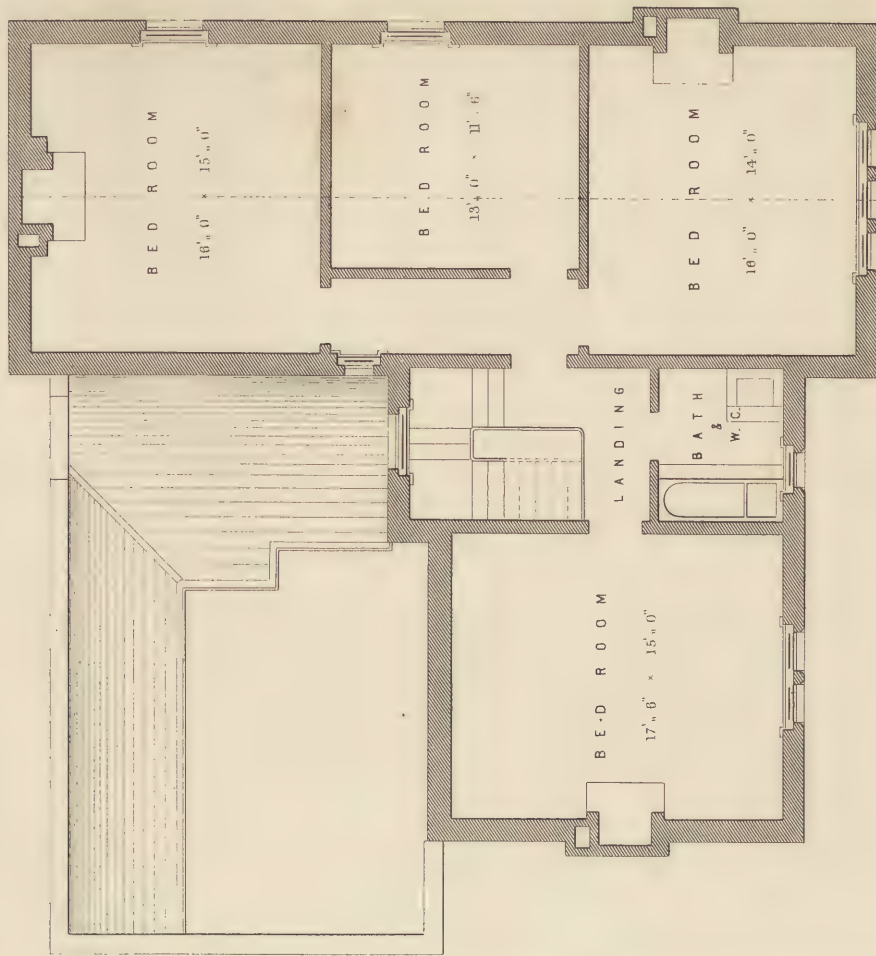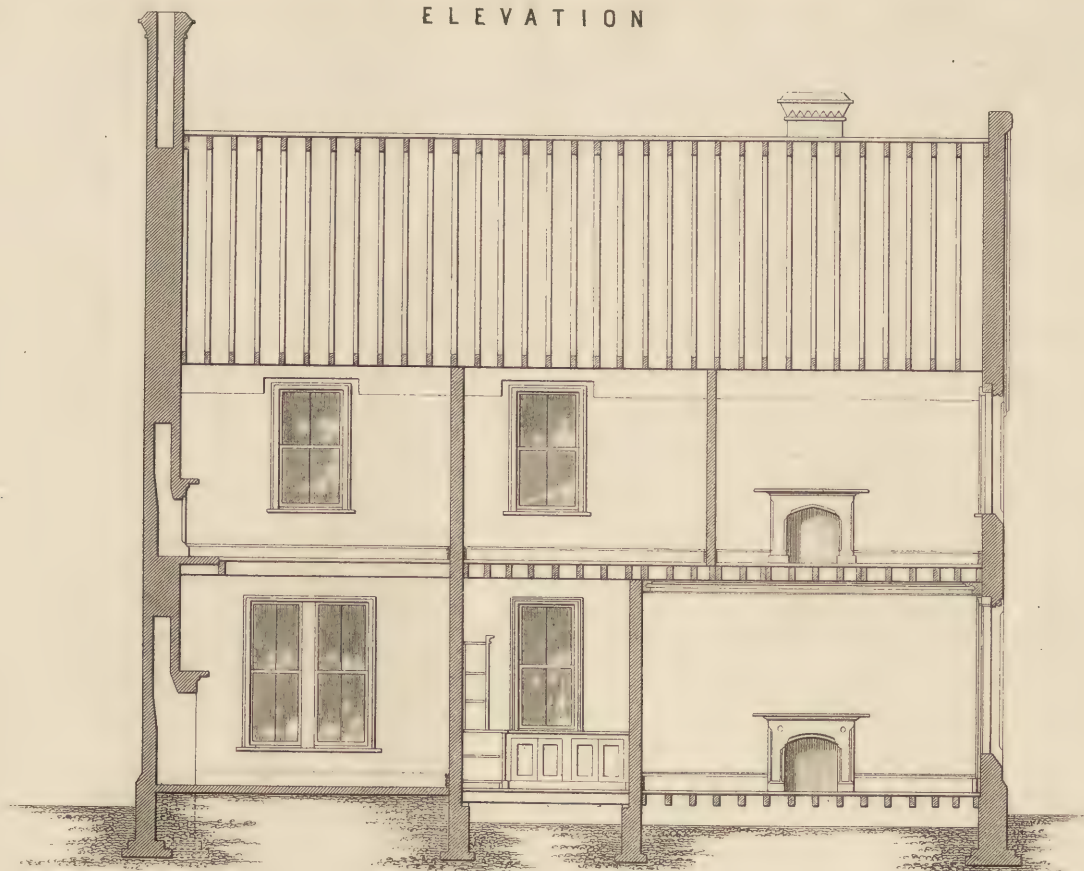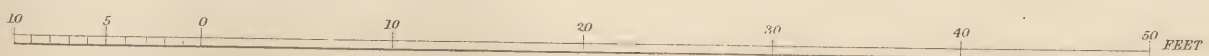
PLATES $\frac{f}{1}$ — $\frac{f}{2}$.

DESIGN FOR A GOTHIC COTTAGE.

PLATES $\frac{f}{1}$ — $\frac{f}{2}$ contain Ground Plan, Bedroom Plan, Elevation, and Section of a small Cottage in the Gothic Style, treated in the simplest manner. It is shewn to be built of brick, with the weathering of the base-course, seat and steps at entrance door, mullions, jambs, cills and lintels of doors and windows, factables, and chimney cappings of dressed stone; the mullions and jambs of doors and windows to be stop-chamfered, the lintels being moulded and ornamented with sunk notch ornament as shewn. The roof to have a tile ridge cresting.

PLATE $\frac{f}{1}$.—GROUND PLAN,—On the Ground Floor there are a drawing-room, dining-room, china-closet, butler's pantry, kitchen, and scullery; and, if it is found necessary, cellar accommodation may be provided below the drawing-room and hall, access to which could be obtained under the stairs. The dining-room measures 18 feet by 16 feet, and is supplied with a direct communication from the kitchen and butler's pantry by a passage. The drawing-room, which is situated on the opposite side of the lobby, measures 17 feet 6 inches by 15 feet, and has one large three-light window. The butler's pantry measures 11 feet 6 inches by 9 feet, and is provided with all neces-sary fittings. The kitchen measures 16 feet by 15 feet, with access from the court through a small scullery measuring 10 feet square. All necessary kitchen offices are provided in the court.

The height of the Ground Floor is 11 feet.

PLATE $\frac{f}{1}$.—BEDROOM PLAN.—On the Bedroom Floor there are four good bedrooms, and a bath-room and water-closet placed over the lobby. The bedrooms measure respec-tively 17 feet 6 inches by 15 feet; 16 feet by 14 feet 3 inches; 13 feet by 11 feet 6 inches; and 16 feet by 15 feet. Three of the bedrooms have fireplaces.

The height of the Bedroom Floor is 10 feet.

DESIGN FOR A GOTHIC COTTAGE.

PLATE ƒ contains Front Elevation and Section. The Elevation shews the entrance door with its outside seat and small window of the lobby, the windows of the dining and drawing rooms, and those of the bedrooms over.

The Section is cut on the line A—B through the kitchen, butler's pantry, and dining-room on the Ground Floor, and through the respective bedrooms over.
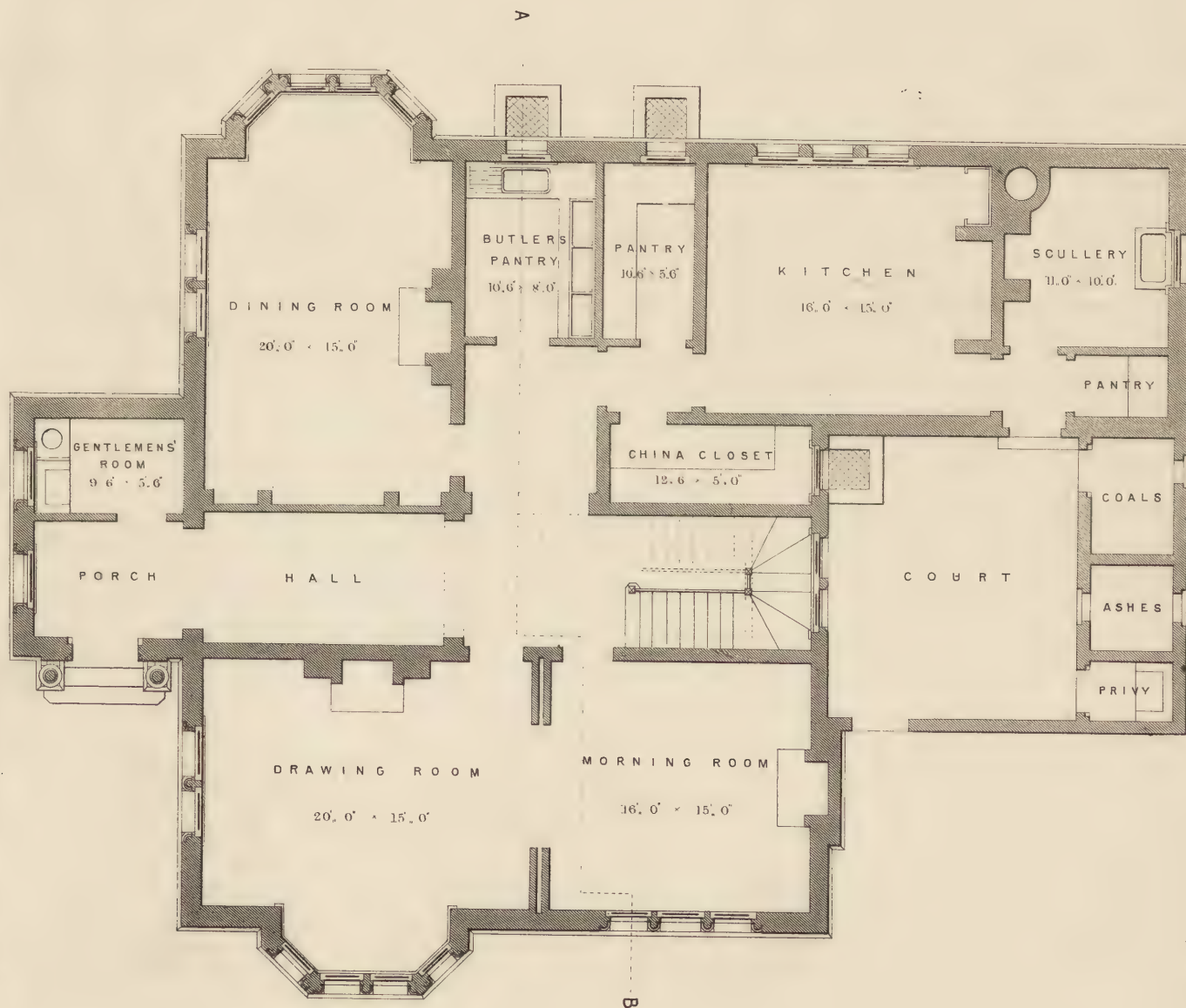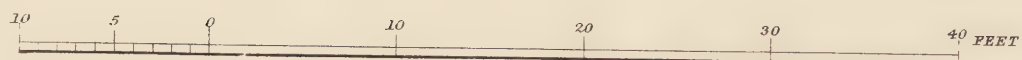
A

DINING ROOM
20'. 0" × 15'. 6"

BUTLERS
PANTRY
10'.6" × 8'.0"

PANTRY
10'.6" × 5'.6"

KITCHEN
16'. 6" × 15'. 0"

SCULLERY
11'.0" × 10'.6"

GENTLEMENS'
ROOM
9'.6" × 5'.6"

PANTRY

CHINA CLOSET
12'.6" × 5'.0"

COALS

PORCH

HALL

COURT

ASHES

PRIVY

DRAWING ROOM
20'. 0" × 15'. 0"

MORNING ROOM
16'. 0" × 15'. 0"

B

GROUND PLAN

10   5   0   10   20   30   40 FEET

BED ROOM
15,0" × 15,0"

BED ROOM
15,0" × 16,0"

BATH ROOM
10,6" × 16,9"

BED ROOM
10,6" × 10,0"

W. C.

BED ROOM
15,3" × 15,0"

LINEN
CLOSET

STAIR TO SMOKING ROOM
OVER

BED ROOM
19,6" × 13,0"

BED ROOM
16,6" × 15,3"

BED ROOM
20,0" × 15,3"

A

B

BED ROOM PLAN

WILLIAM MACKENZIE, GLASGOW, EDINBURGH & LONDON.

40 FEET

30

20

10

0

5

10

WEST ELEVATION

VILLA
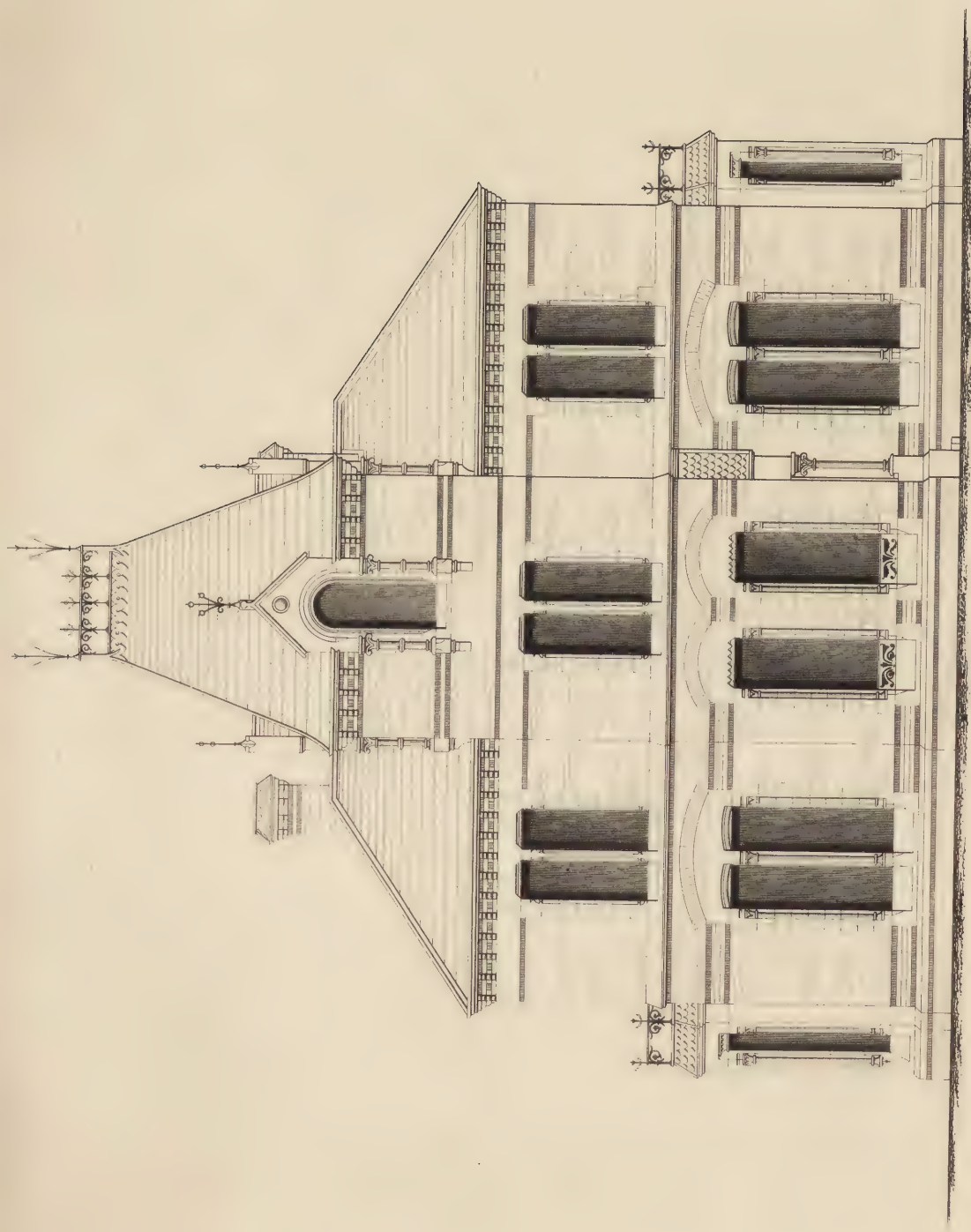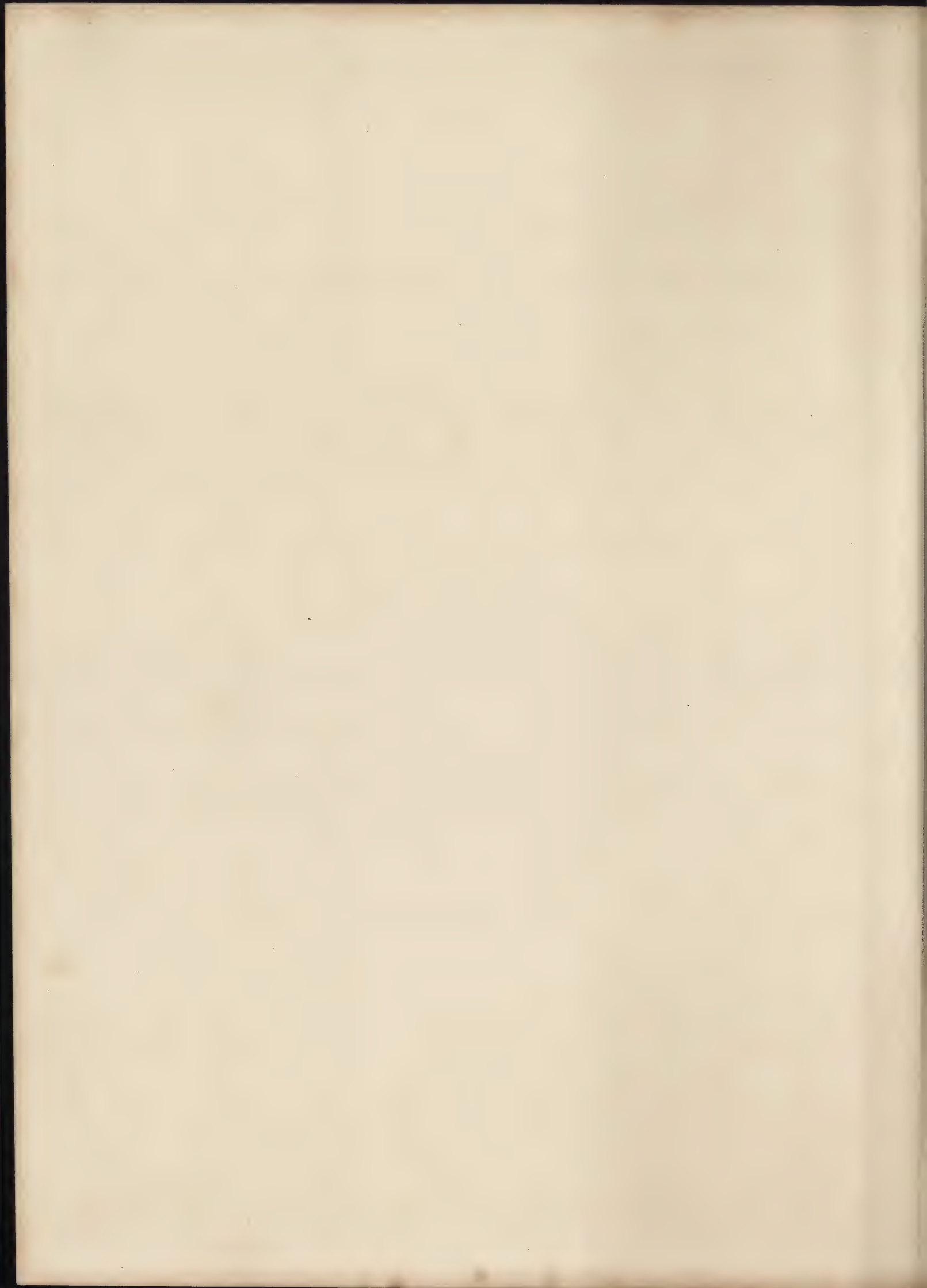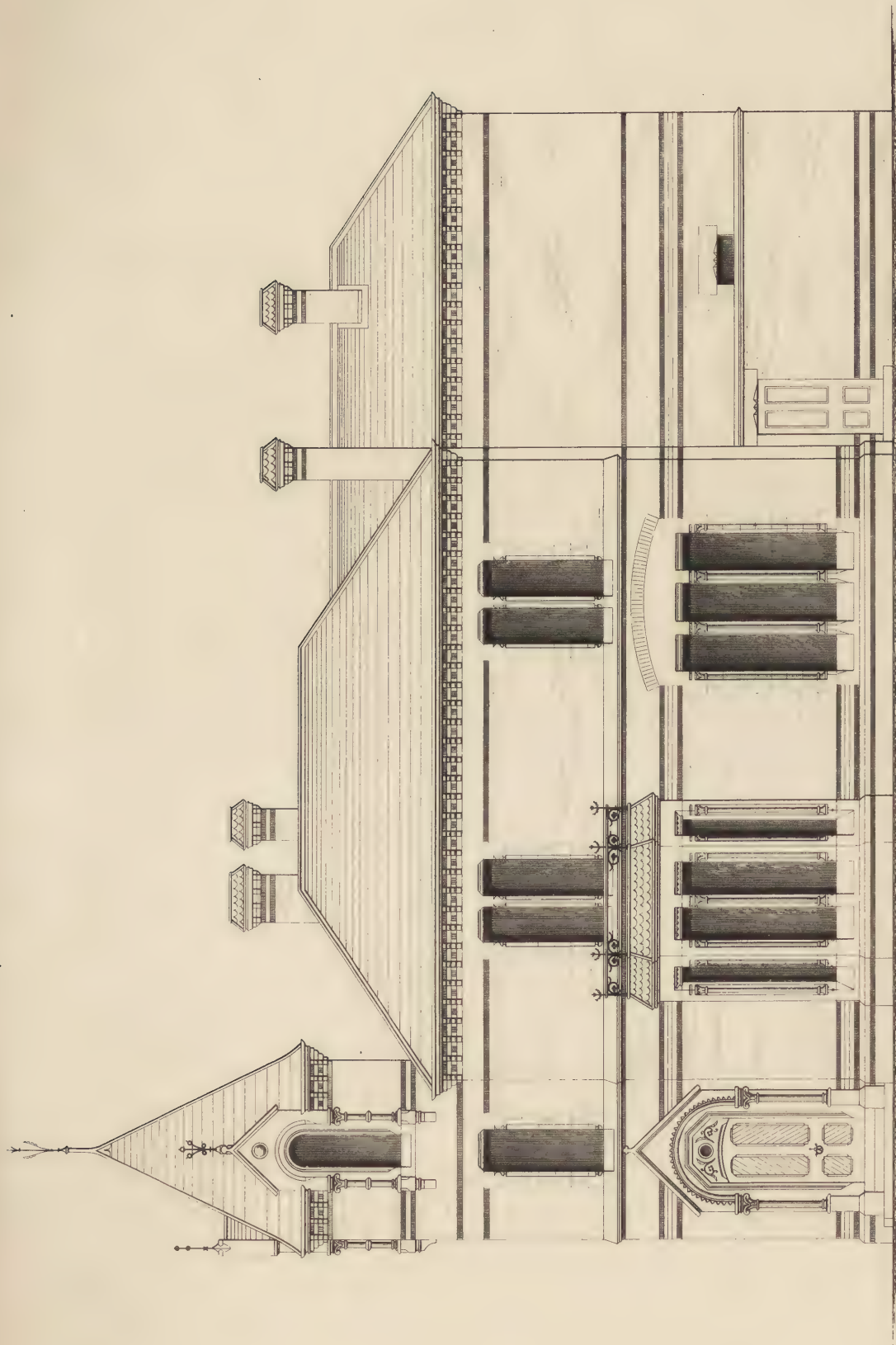
SOUTH ELEVATION

WILLIAM MACKENZIE, GLASGOW, EDINBURGH & LONDON
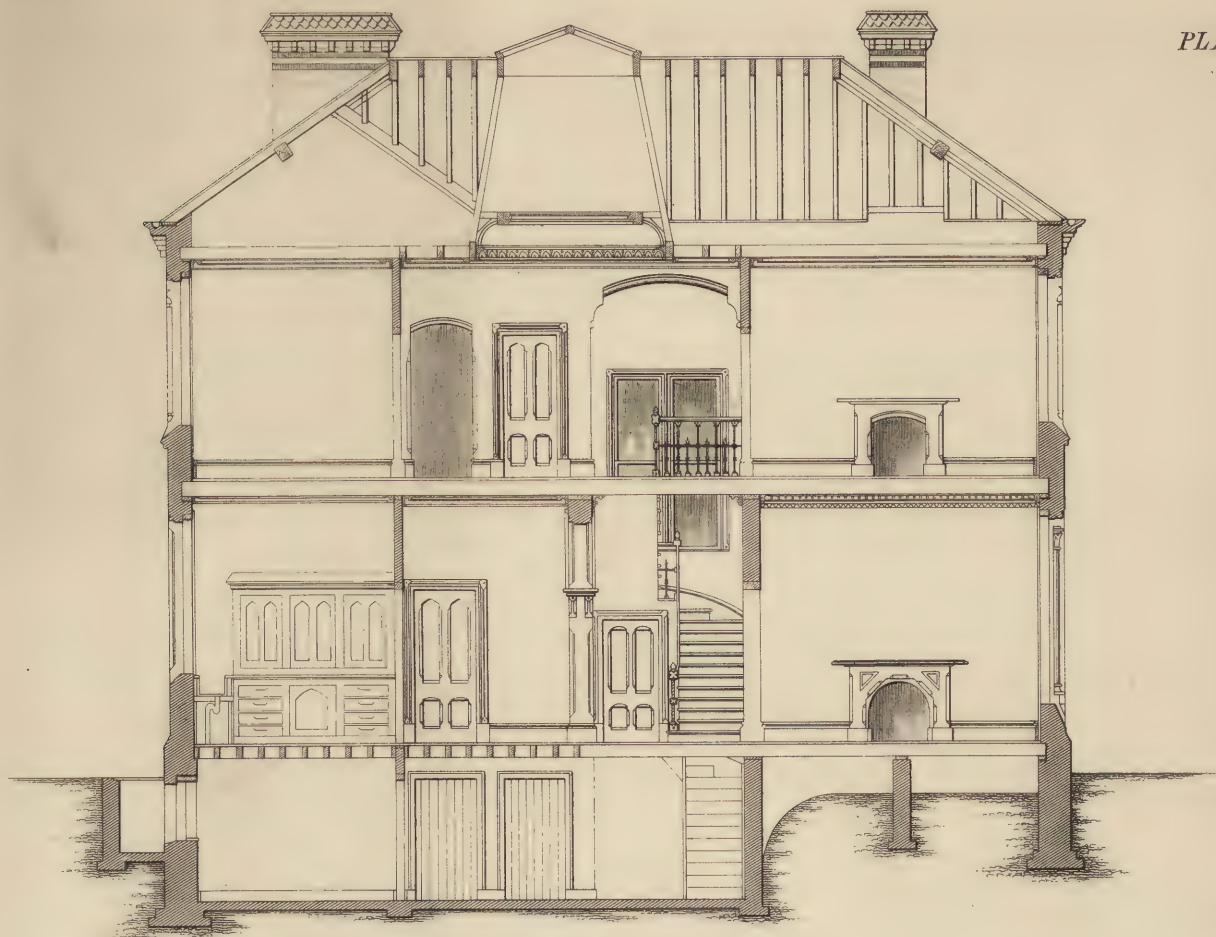
FEET

SECTION AT A.B
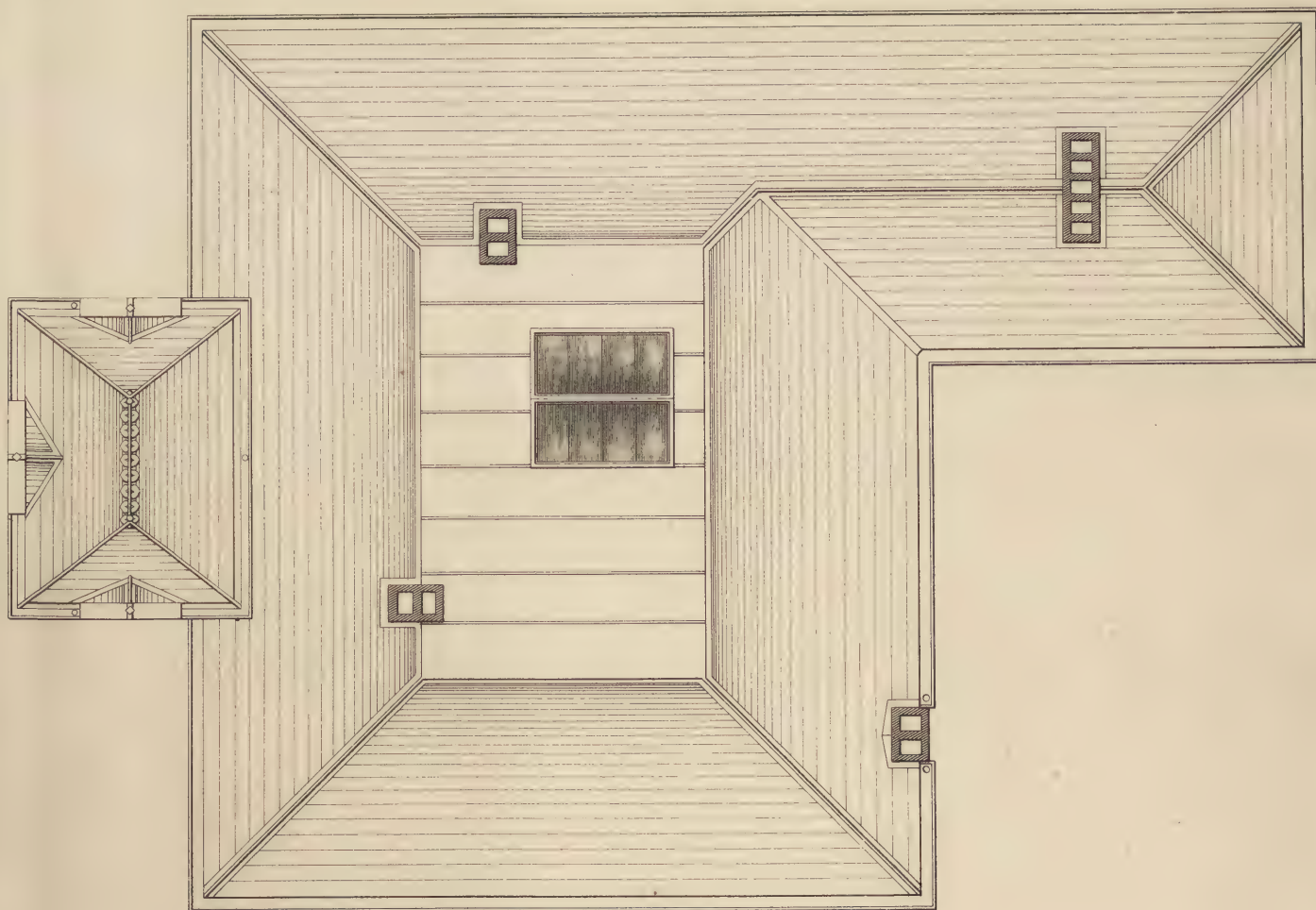
PLAN OF ROOF

10   5   0   10   20   30   40 FEET

VILLA ———— DETAILS ———— PLATE $\frac{7}{6}$

BEDROOM WINDOWS
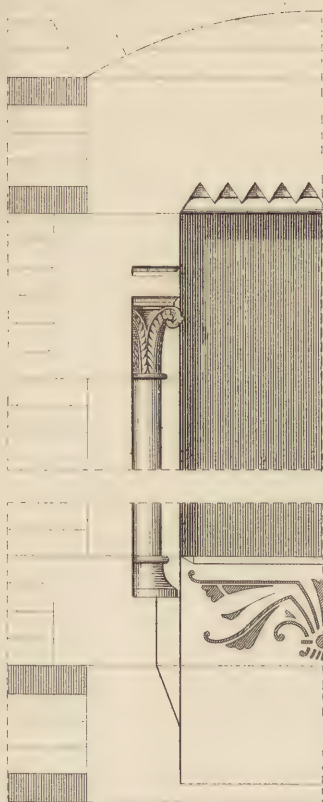
LOWER WINDOWS
OF TOWER

DORMER WINDOWS
OF TOWER

BOW WINDOWS

12 9 6 3 0   1   2   3   4   5   6   7   8   9   10 FEET

DETAILS
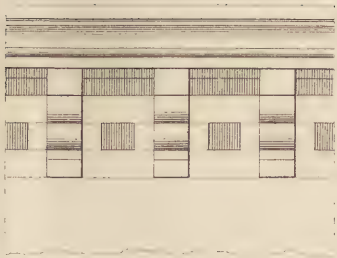
CORNICE

SECTION OF CORNICE

CHIMNEY HEAD

FRONT

SIDE

ENTRANCE DOORWAY

12 9 6 3 0   1   2   3   4   5   6   7   8   9   10 FEET
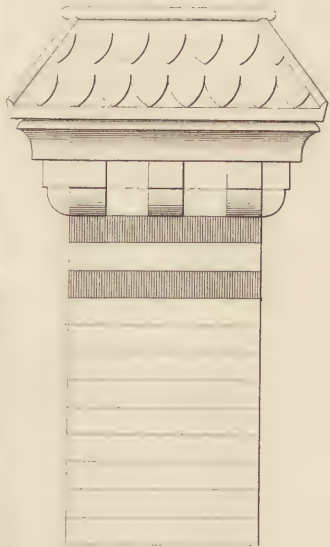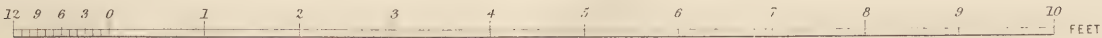
PLATES $\frac{i}{1} - \frac{i}{7}$.

DESIGN FOR A VILLA.

PLATES $\frac{i}{1} - \frac{i}{7}$ contain a Design for a commodious villa, illustrated by a Ground Plan, Bedroom Plan, South Elevation, West Elevation, Section, Roof Plan, and Details.

The drawings shew the villa to be built of brick, with the finishings of the doors, windows, &c., of dressed stone: but, like most of the previous designs for brick houses, it can be built entirely of stone. Rubble may be used for the walls generally, or, as the design partakes of the flat character usual in works of the Anglo-Italian Style, the whole exterior may be executed in clean dressed or polished stone with good effect. The adoption of stone in lieu of brick will necessitate the introduction of dressed quoins to all the angles of the main building and entrance tower.

The under portion of the cornices, shewn to be of projecting moulded bricks, will have to be altered in design if stone be used throughout. Simple moulded brackets, set from one to two feet apart, would be quite suitable.

The brickwork of the cornices and the bands running between the cills and the lintels of the windows, &c., are intended to be of pressed red and black bricks. The rest of the walls may be of grey stock or of red pressed brickwork as taste directs. The relieving arches over the lintels, where shewn, are to be flush with the wall surface, and should be of the same colour of brick as the walls themselves.

The ornaments in the dados of the lower windows of entrance tower are intended to be incised or sunk square in the stone.

The whole of the details partake of an early Gothic feeling, which will aid in rendering the villa pleasing and tasteful.

PLATE $\frac{i}{1}$.—GROUND PLAN.—On the Ground Floor there are three reception rooms, gentlemen's room, kitchen, butler's pantry, store pantry, china closet, scullery, cook's pantry, and the necessary out offices. The dining-room, situated on the north of the

entrance hall, measures 20 feet by 15 feet, exclusive of its bay window. The kitchen, butler's pantry, store-room, and china closet are conveniently placed in relation to the dining-room.

The drawing-room measures 20 feet by 15 feet, exclusive of its bay window. The morning-room, 16 feet by 15 feet. These rooms open into each other by sliding doors.

The gentlemen's room, situated in the entrance tower, is fitted up with a water-closet, wash basin, &c.

The height of the Ground Floor is 13 feet.

PLATE $\frac{i}{2}$.—BEDROOM PLAN.—On the Bedroom Floor there are seven bedrooms, measuring respectively 20 feet by 15 feet 3 inches; 19 feet 6 inches by 13 feet; 16 feet by 15 feet 3 inches; 15 feet 3 inches by 15 feet; 15 feet by 13 feet; 10 feet 6 inches by 10 feet; and 15 feet by 10 feet. To these are added a bath-room, a detached water-closet, and a large linen-closet.

The height of the Bedroom Floor is 11 feet 6 inches.

PLATES $\frac{i}{3}$ and $\frac{i}{4}$ contain the West and South Elevations.

PLATE $\frac{i}{5}$ contains the Section and the Roof Plan. The former is cut on the line A—B through the dining-room, hall, and drawing-room on the Ground Floor; and through two bedrooms and the landing, &c., on the Bedroom Floor.

PLATES $\frac{i}{6}$ and $\frac{i}{7}$ contain the principal details of the various ornamental portions of the design.
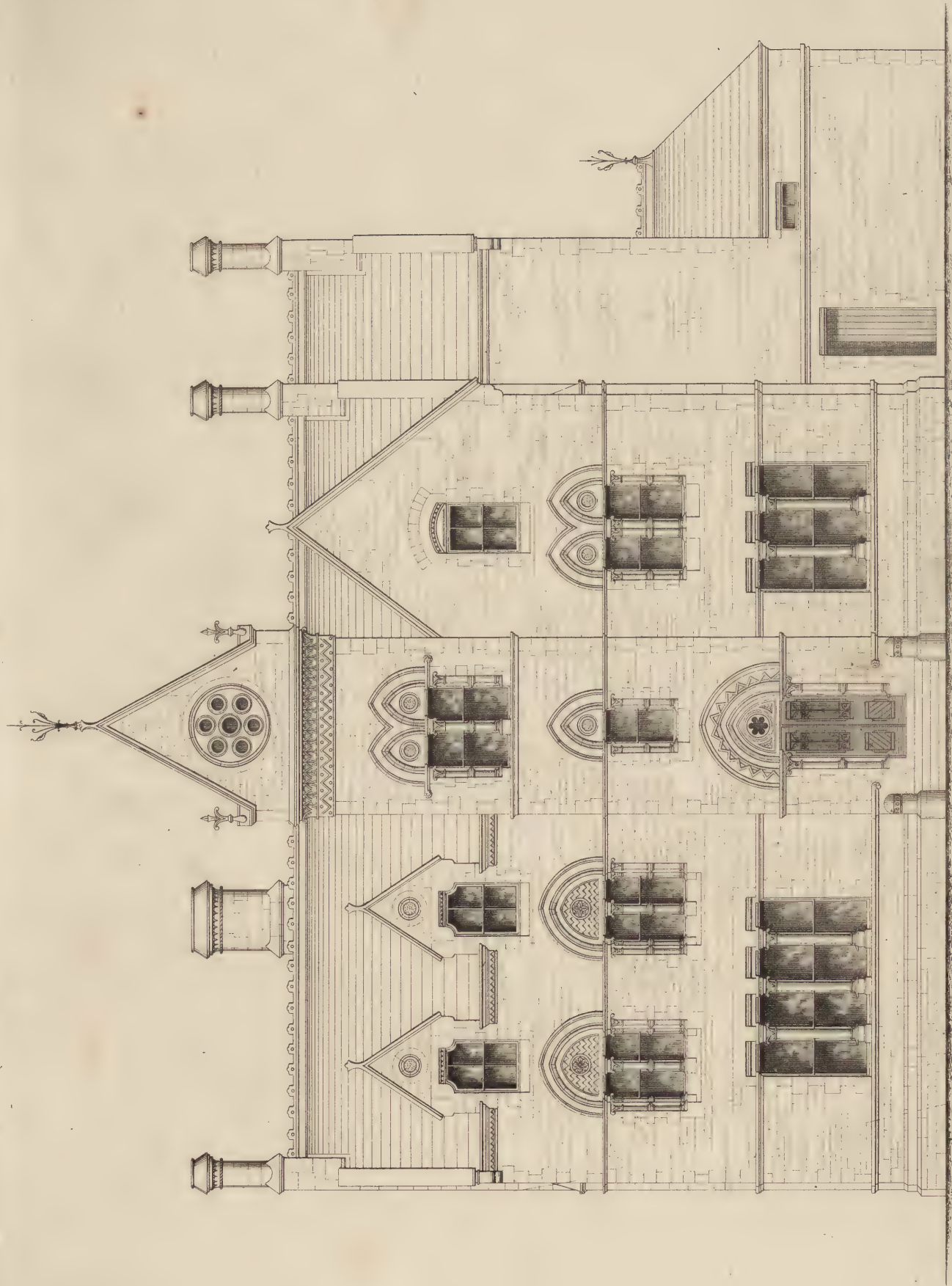
FRONT ELEVATION.

FEET

10 5 0 10 20 30 40

PLATE 2

A

BED ROOM
14' 6" × 13' 0

BED ROOM
12' 0" × 9' 6"

BED ROOM
13' 0" × 8' 6"

PASSAGE

BED ROOM
20' 0" × 15' 0"

BED ROOM
21' 6" × 10' 0"

LANDING

BED ROOM
18' 0" × 15' 0"

LINEN
CLOSET

BED ROOM
13' 6" × 10' 6"

BED ROOM
25' 6" × 16' 0"

B
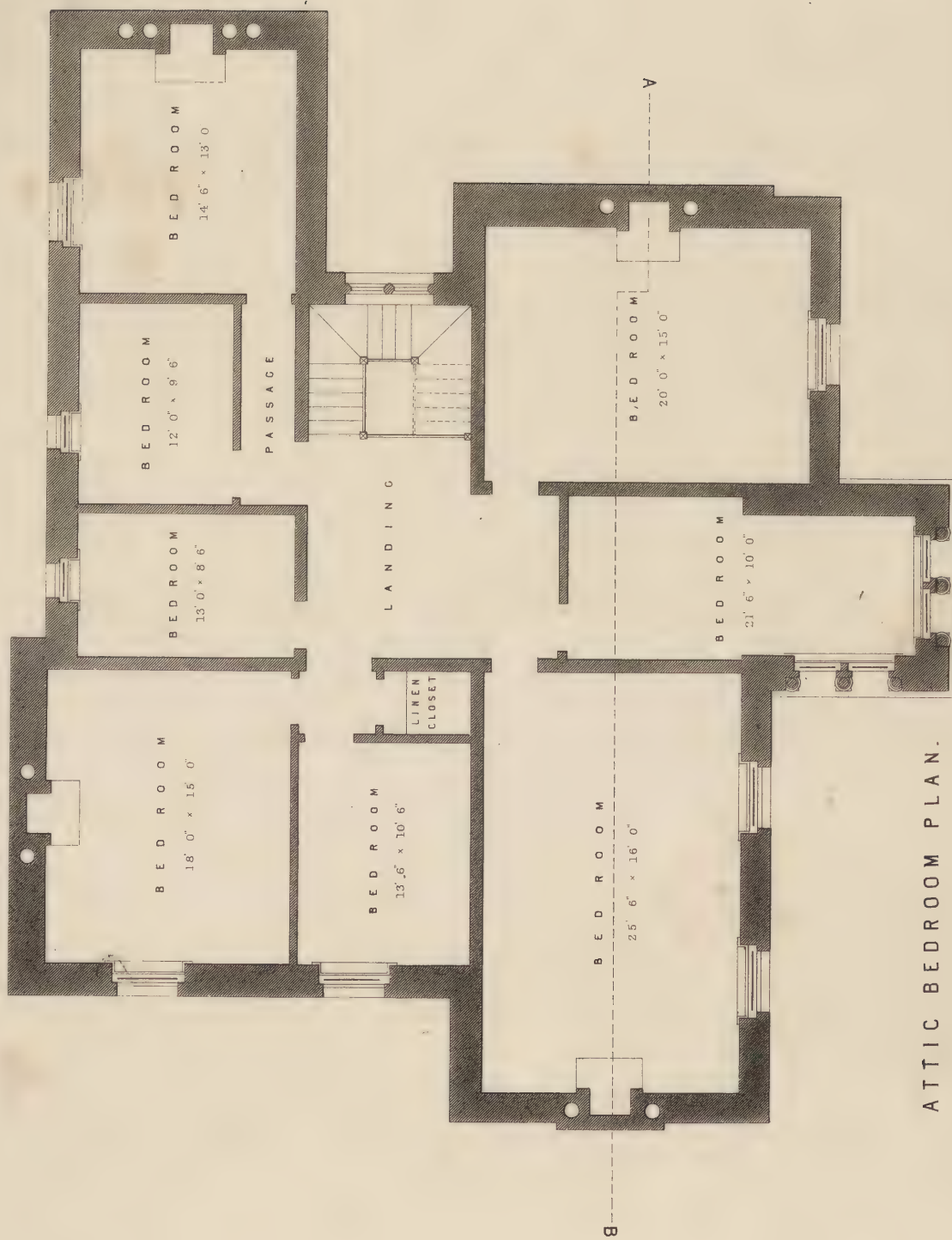
ATTIC BEDROOM PLAN.

10   5   0   10   20   30   40
FEET

WILLIAM MACKENZIE, GLASGOW, EDINBURGH & LONDON.

SIDE. ELEVATION.

10   5   0   10   20   30   40

FEET

SECTION AT A.B.

WILLIAM MACKENZIE, GLASGOW, EDINBURGH & LONDON.

10 5 0 10 20 30 40 FEET

SCULLERY
11' 6" × 9' 6"

PANTRY

COALS
7' 6" × 6' 0"

ASHES
6' 0" × 6' 0"

PRIVY
6' 0" × 3' 6"

A

COURT

KITCHEN
18' 0" × 14' 0"

STORE ROOM
9' 0" × 8' 0"

STAIRCASE

MORNING ROOM
20' 0" × 15' 6"

BUTLERS
PANTRY
13' 0" × 9' 0"

HALL

VESTIBULE
8' 6" × 8' 6"

DINING ROOM
25' 0" × 18' 0"

DRAWING ROOM
25' 6" × 16' 0"

B

GROUND PLAN.

FEET

50

40

30

20

10

10   5   0

BEDROOM PLAN.

BED ROOM
18' 6" × 13' 0"

HOUSE MAIDS CLOSET
9' 0" × 3' 6"

SINK

W.C.
9' 0" × 3' 6"

W.C. AND BATH ROOM
13' 0" × 9' 0"

BED ROOM
26' 0" × 18' 0"

LANDING

BED ROOM
20' 0" × 15' 6"

DRESSING ROOM
21' 6" × 10' 0"

BED ROOM
25' 6" × 16' 0"

A

B
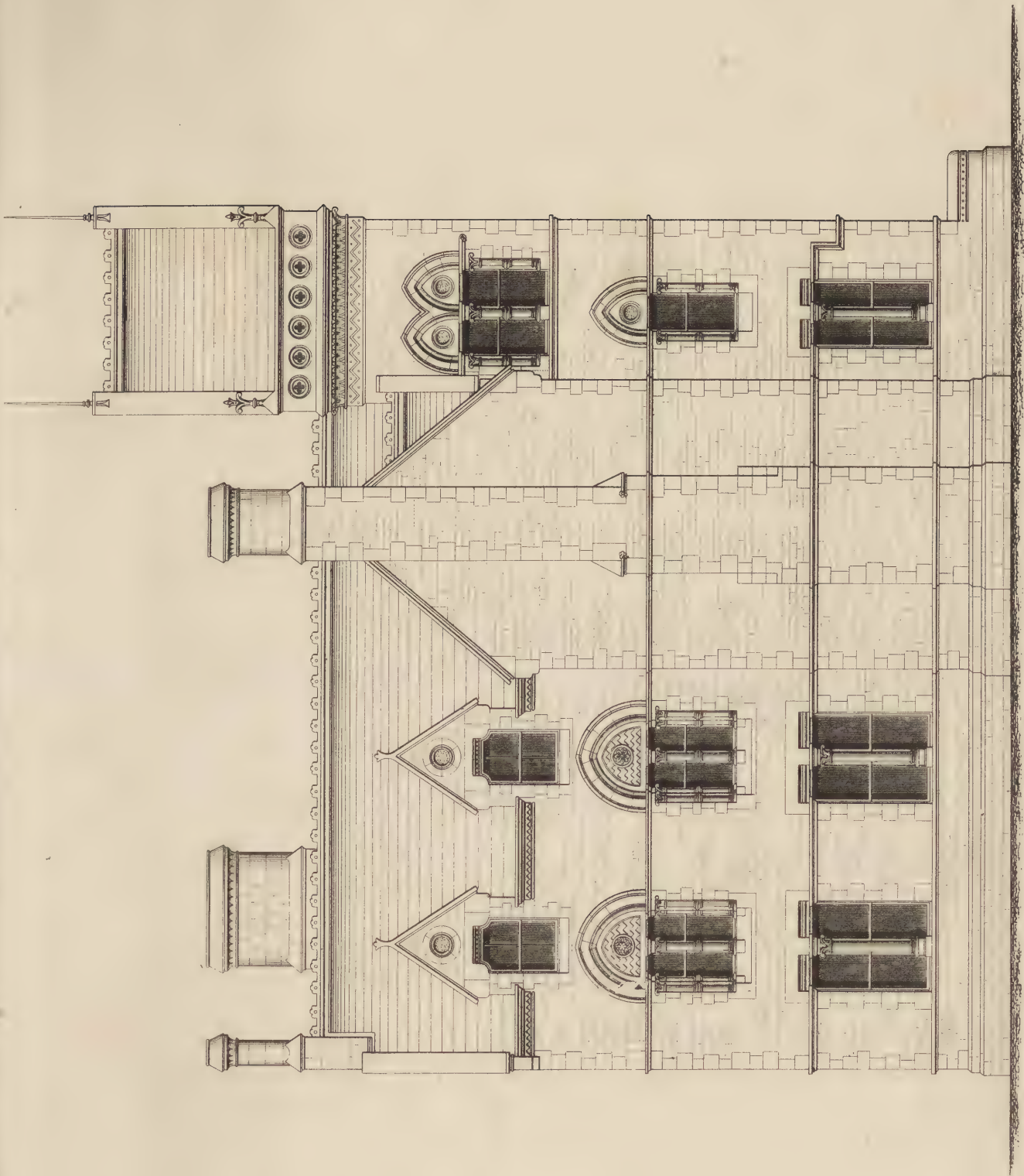
FEET
50   40   30   20   10   0   5   10
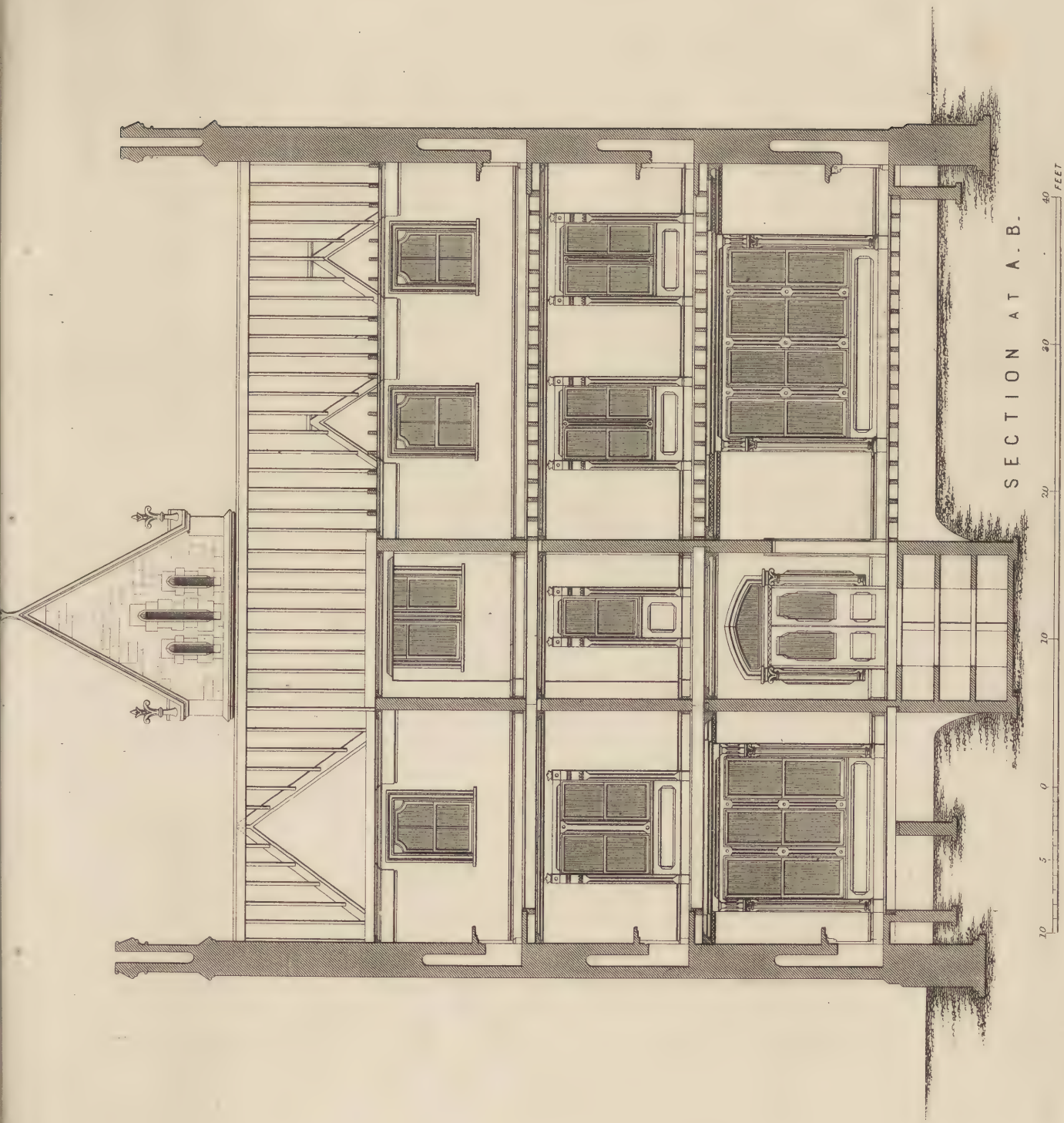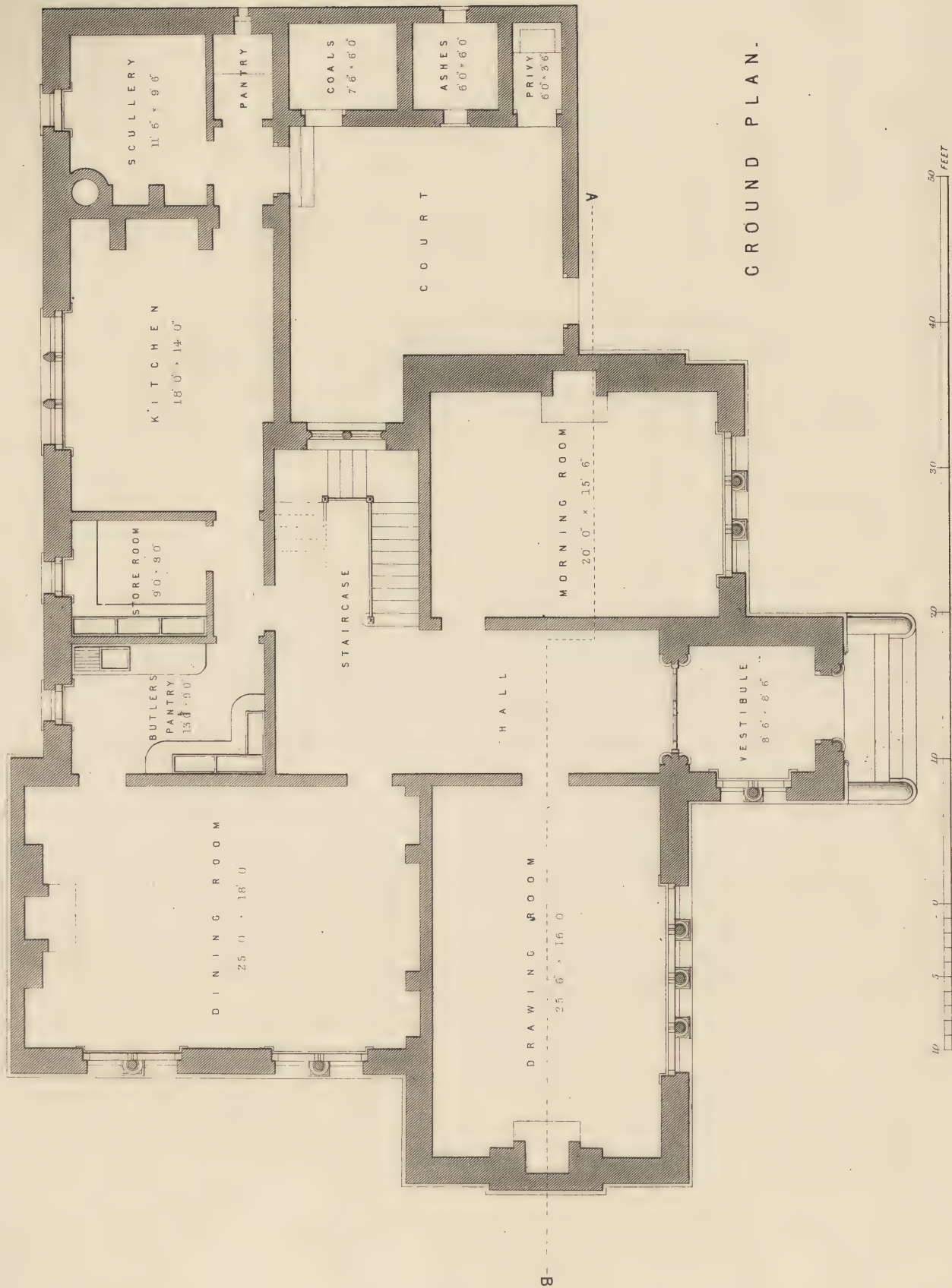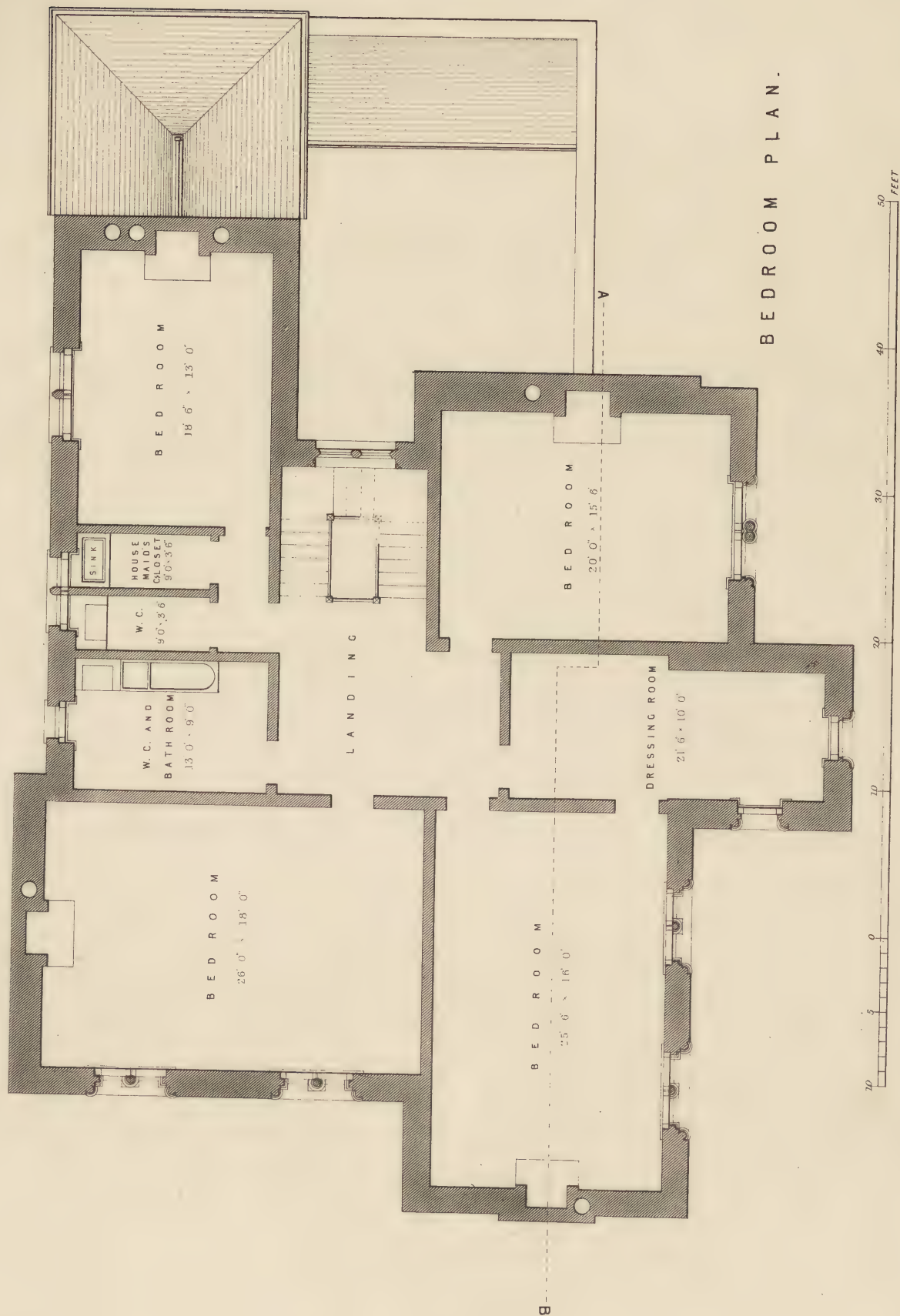
PLATES $\frac{j}{1}$ — $\frac{j}{6}$.

DESIGN FOR A GOTHIC VILLA.

PLATES $\frac{j}{1}$ — $\frac{j}{6}$ contain a Design for a villa in the early Gothic style, illustrated by a Ground Plan, Bedroom Plan, and Attic Bedroom Plan, Front Elevation, Side Elevation, and Section. The villa is shown to be built of stone, and the general wall surfaces should be of neat rubble work, and the finishings of dressed stone of a different colour. The columns throughout the building should be of a stone contrasting with the colour of the finishings, or of polished granite. All the windows of apartments should be of plate glass, while those of vestibule and staircase may appropriately be filled with ornamental or stained glass. The roofs may be covered with plain or ornamental slating—the latter is most to be recommended.

PLATES $\frac{j}{5}$ — $\frac{j}{6}$.—GROUND PLAN.—On the Ground Floor there are three large reception rooms, viz., dining-room, 25 feet by 18 feet; drawing-room, 25 feet 6 inches by 16 feet; and morning-room, 20 feet by 15 feet; a kitchen, measuring 18 feet by 14 feet; scullery, 11 feet 6 inches by 9 feet 6 inches; a store-room, 9 feet by 8 feet; and butler's pantry, 13 feet by 9 feet. The entrance vestibule, situated in the tower, opens into the hall, at right angles to which is placed the staircase. All the reception rooms open from the hall, and the dining-room has a service door opening from the butler's pantry, which is placed in a convenient position with regard to the kitchen. The butler's pantry is fitted with cupboards and sink, and the store-room with cupboards and shelves. The scullery is furnished with a boiler and fireplace, and has a pantry adjoining it opening from the kitchen lobby. In the kitchen court are provided a coal-house, ashpit, and privy. Access to the cellars is to be underneath the main staircase.

The height of the Ground Floor is 12 feet.

BEDROOM PLAN.—On the Bedroom Floor there are four large bedrooms, a dressing-room, bath-room, water-closet, and house-maid's closet. The bedrooms measure respectively 26 feet by 18 feet; 25 feet 6 inches by 16 feet; 20 feet by 15 feet; and 18 feet 6

inches by 13 feet. The dressing-room is 21 feet 6 inches by 10 feet, and opens from the bedroom over the drawing-room.

The height of the Bedroom Floor is 10 feet 6 inches.

PLATES $\frac{j}{1}$ — $\frac{j}{2}$ contain Front Elevation and Attic Bedroom Plan. The former shows the tower, which gives considerable character to the house. The principal entrance, placed in it, is reached by a small flight of steps between retaining walls. A double base course is shown round the principal part of the house; but a single one may be substituted without interfering with the design, if expense is any object.

ATTIC BEDROOM PLAN.—On this floor there are four large and convenient bedrooms, four smaller ones, and a linen closet. The principal bedrooms measure 25 feet 6 inches by 16 feet; 20 feet by 15 feet; 18 feet by 15 feet; and 14 feet 6 inches by 13 feet, and each room is furnished with a fireplace.

The height of this floor is 10 feet.

PLATES $\frac{j}{3}$ — $\frac{j}{4}$ contain Side Elevation and Section. The Elevation shows the gable of the drawing-room wing, the windows of the dining-room on the left, and the flank of the tower on the right, with the window of the vestibule, and above the latter, the side windows of the dressing-room and bedroom over.

The Section is cut on the line A—B through the morning-room, hall, and drawing-room, and the respective bedrooms over. In the hall is shown the swing vestibule doors, and under it the section of the wine cellar. The other cellars are intended to be under the back part of the house.

ORDERS OF ARCHITECTURE.

THE moderns have applied the term "order" to those architectural forms with which the ancient Greeks and Romans composed the exteriors of their temples. There are generally understood to be five orders of Architecture, namely—the Tuscan, the Doric, the Ionic, the Corinthian, and the Composite. The Doric, the Ionic, and the Corinthian orders were originally designed by the Greeks, who knew nothing of the Tuscan and the Composite orders. The Romans borrowed the three Grecian orders, and modified them to suit their own purposes; and to these they added the Tuscan and Composite orders. The latter orders, however, have little claim to be separately classed, as they have much in common with the former three. The Tuscan order, by its title, enables us to assign its origin to Tuscany, which is indeed the more certain by the fact, that the Tuscans were originally a colony of Dorians. The Composite order, as the name implies, is compounded from the other orders, and may be called, in truth, a corrupted Corinthian. The characteristics of an order are determined not so much by the ornaments with which it is embellished, as by the essential proportions of its parts.

It appears then from this, that there are three Grecian and five Roman orders; and the Doric, Ionic, and Corinthian being common to both, they are distinguished as Grecian Doric, Roman Doric, and similarly for the Ionic and Corinthian.

The leading members of an order are—1, a platform; 2, perpendicular supports; and 3, a lintelling or covering connecting the tops of the supports, and covering the edifice. The proportioning of these parts to the edifice and to each other, with the addition of suitable decorations, constitutes an *order* or *rule*. The principal member is the upright support or column, the accompanying members being subservient to this leading feature; the bottom of the column rests either on a general platform, or upon a particular square plinth. The lower part of the column resting upon the square plinth is usually encompassed with a selection of mouldings, which, from their position, are, in conjunction with the plinth, termed the Base of the column. The upper end is likewise covered with a

A

plinth, which, in conjunction with the accompanying mouldings on the upper end of the column, is termed the Capital of the column. The body of the column, or that part situated between the base and the capital, is called the Shaft. The lintelling or covering which lies upon the columns is denominated the Entablature, and is subdivided into three parts—the Architrave, Frieze, and Cornice. The architrave represents a mere lintel, embracing the tops of the columns; the frieze is intended to signify generally the ends of the cross-beams resting upon the lintels, having the spaces between them filled up, and having also a plain moulding to separate it from the architrave, and to conceal the horizontal joint formed by the two members; the upper member or cornice represents the projecting eaves of a Greek roof, showing the ends of the rafters. The whole is distinctly exemplified in the Grecian Doric order.

Mouldings.—Before going into the details of the orders, it will be necessary to give an account of the various mouldings employed in Greek and Roman architecture. And, in the first place, mouldings may be defined to be prismatic or annular solids, formed by plane and curved surfaces, which are employed as ornaments, and are considered as forming constituent parts of an order. If we conceive a straight moulding to be cut through at right angles to its length, the section thus formed is termed its profile, and exhibits exactly its characteristic outline, from which its name is derived. Annular mouldings, again, or such as are formed upon a round surface, as the surface of a column, must be cut by a plane passing through the centre line or axis of the column, in order to exhibit their characteristic sections or profiles.*

A prevailing gracefulness of outline characterizes the mouldings of the Grecian orders, which at once distinguishes them from the more unpretending and simpler mouldings of the Romans. Various modes are employed for describing the Roman, and more especially the Greek mouldings, so various are their applications and the modifications of form to which they are subject. The Roman mouldings, however, are usually composed of circular arcs. The Grecian mouldings exhibit every variety of conic section—elliptical, parabolical, and hyperbolical—the circle being seldom employed but in small cavettos and mouldings of contrary flexure.

The regular mouldings are eight in number, and are thus named:—The Fillet or Band, the Torus, the Astragal or Bead, the Ovolo, the Cavetto, the Cyma recta, the Cyma reversa or Talon, and the Scotia.

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* It is by some considered preposterous to lay down rules for the construction of contours, which are said to be subjected to no law of form, except what is furnished by the individual's own taste. Seeing, however, that beautiful outlines may doubtless be traced by means of regular geometrical constructions, we think the insertion of the more common of these methods will be useful to those who cannot readily sketch for themselves.

The *fillet*, *a*, fig. 1, is the smallest rectangular member in any composition of mould-ings. When it stands upon a flat surface, its projection from the surface is generally made equal to its height. In general it is employed to separate other members.

Fig. 1.

In the following descriptions, the extreme points of the curves are always assumed to be given.

The *torus* and *astragal*, shaped like ropes, are intended to bind and strengthen the parts to which they are applied. In form the torus is a semicircle, which projects from a vertical diameter. Thus, in fig. 2, let *a b* be the vertical diameter, from which the torus projects; bisect, or divide in two equal parts, the line, *a b*, at the point, *c*; from *c* as a centre, describe the semicircle, *a d b*; this will be the profile of the torus, which, it will be noticed, is surmounted by a fillet, *b e*. The astragal is described in the same way as the torus, the only distinction between them being that, when employed in the same order, the astragal is smaller than the torus. The torus is generally employed in the bases of columns; the astragal, both in bases and capitals.

Fig. 2. Fig. 3. Fig. 4.

The ovolo is a member strong at the extremity, and obviously intended for support; it is usually employed above the eye, as a supporter to the essential members of the composition. The Roman ovolo consists of a quadrant or a less portion of a circle, and is described as in fig. 3, the height and pro-jection being given. And first, let the height be equal to the projection. Draw *a b* equal to the height, and *b c* at right angles with, and equal to, *a b*, for the projection. The quadrant, *a c*, described from the centre, *b*, with a radius, *b a*, or *b c*, is the contour of the ovolo. But when the projection is less than the height, as in fig. 4, draw *a b* and *b c*, as before, at right angles, *a b* being the height, and *b c* the projection. From the point, *a*, draw an arc of a circle, *b d*, with the radius, *a b*, and from the point, *c*, with the same radius, describe another arc, cutting the former arc at *d*; the point, *a*, is the centre from which the ovolo is to be described, with the radius, *d a*, or *d c*; this being done, the curve, *a c*, is the contour of the ovolo.

The Greek ovolo, fig. 5, unlike the Roman ovolo, cannot be described by means of circular arcs; it must be described by finding a number of points in it. For this purpose draw the tangent, *a c*, from the lower extremity, *a*, indicating the inclination of the curve at that point; draw also the vertical line, *d b c*, through the extreme point, *b*, or projection of the curve. Draw *b e* parallel to *c a*, and *a c f* parallel to
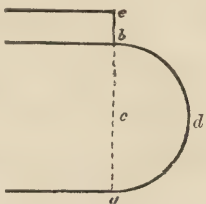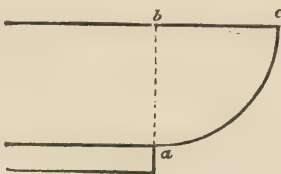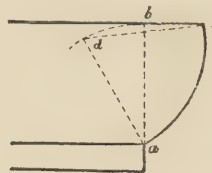
c b; make *e f* equal to *a e;* divide the lines *e b* and *b c* into the same convenient number of equal parts; draw straight lines from the point, *a,* to the points of division

Fig. 5.
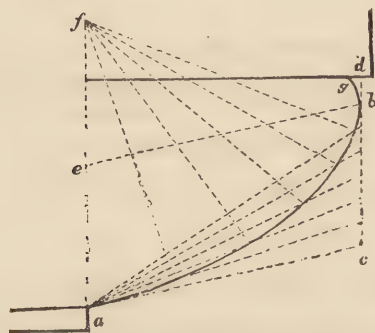
in *b c,* and similarly draw straight lines from the point, *f,* through the points of division in *b e,* meeting successively the lines drawn from *a* to *b c;* the points of intersection of the pairs of lines thus drawn will be as many points in the contour of the moulding, and a curve line traced so as to embrace these points will be the greater part of the contour. The remaining part, *b g,* if required to be determined in the same manner, may be found by drawing lines from *a* instead of *f,* through the points in *b e,* and from *f* to *b d,* instead of from *a* to *b c.* Of course this will give a good deal more of the curve than is necessary. The curve drawn in this manner is a portion of an ellipse, somewhat greater than a fourth of the whole circumference. The recess of the moulding, *b g d,* at its projecting point, is denominated a *quirck.* Fig. 5 is, from its great projection relatively to its height, adapted for capitals of Doric columns. With less projection, it would be suitable for entablature.

Fig. 6.
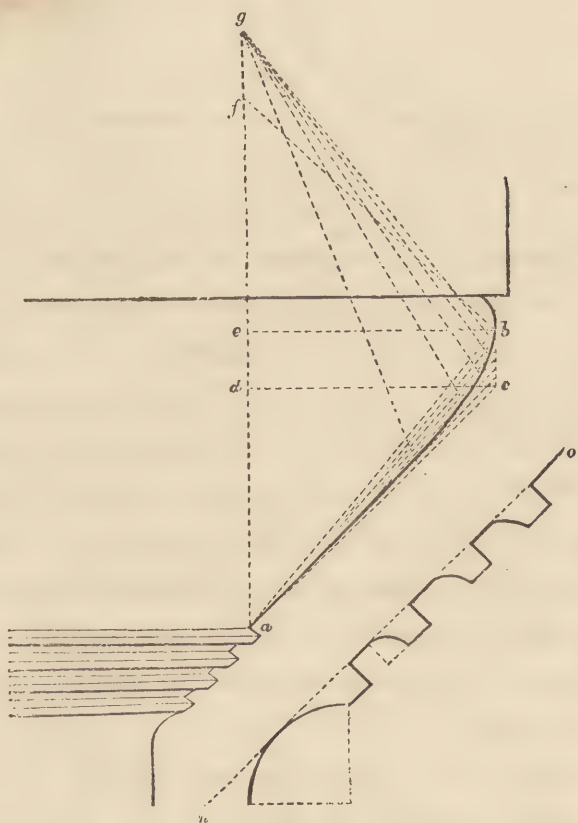
To describe the *hyperbolical ovolo*— fig. 6—as employed in Doric capitals; having given the projection, *b,* of the curve, and the lower extremity, *a,* draw the line, *a c,* in the direction of the lower end of the curve, and *b c* vertically through the point, *b;* draw *a g* vertically from *a,* and *b e* and *c d* perpendicular to *a g;* set off *e f* equal to *a d,* and *e g* equal to *a e;* join *b f,* and divide *b f* and *b c* into the same convenient number of equal parts; draw straight lines from *a* to the points of division in *b c,* and also straight lines from *g* through the points in *f b;* the successive intersections of these lines, as in the foregoing case, are the positions of as many points in the contour. This is the general form of the ovolos in the capitals of the Grecian Doric. It will be seen that the lower part towards *a* is nearly straight, and is succeeded by four fillets,

shown in section on a large scale, and rounded away on the under sides into the funda-mental line, *n o*.

The *cavetto*—figs. 7, 8, and 9—which is the reverse of the ovolo, both in regard to form and to the weakness of the extreme parts, is well adapted for purposes of shelter for the other members. It is always employed as a finishing, and is here applied where strength is required. It is never used in bases or capi-tals, but frequently in entab-latures; thus in the Roman Doric order it forms the crown-ing member of the cornice, and is evidently employed to overhang and shield the under members. The cavetto is

Fig. 7.

Fig. 8.

Fig. 9.

described in the same way as the Roman ovolo; by arcs of circles, which may be either full quadrants or of less extent. The Greek cavetto—fig. 9—is somewhat elliptical, and may be described by a combination of two circular arcs, thus: Let *a b* be the projection of the moulding, and *a c* the vertical line; from the point, *a*, draw *b d* vertically from *b*, and make it equal to *b e*, which is two-thirds of *b a*; from the centre, *d*, describe the arc, *b i*; draw *i n* perpendicular to *e d*, make *n o* equal to *n i*, draw *o p* perpendicular to *a c*, and meeting *e d* produced in *p*, and from the centre, *p*, thus found, describe the arc, *i o*. The contour, *b i o c*, will represent the Greek cavetto.

The *conge* or *scape*—figs. 10 and 11—is a species of cavetto, and is not recognized as a distinct moulding. In section it is partly concave and partly straight, the latter part being vertical. It is employed in the columns of some of the orders, for joining the capi-tals and bases to the shafts. Let *a b* be the projection of the moulding from the vertical line, *a e*, which it is required to touch; and first, if the projection, *a b*, is equal to the height of the curve, make *a c*—fig. 10—equal to *a b*; and from the points, *b* and *c*, as centres, with *a b* or *a c* as a radius, describe the arcs intersecting at *d*; from *d*, with the

Fig. 10.

Fig. 11.

same radius, describe the arc, *b c*; this completes the contour of the conge. The centre, *d*, may likewise be found by drawing *b d* vertically, and making it equal to *a b*.

If the conge contains less than a quarter of a circle, as in fig. 11, let *b e* be the tangent to the curve at the point, *b*; on the vertical, *a f*, set off the distance, *c d*,

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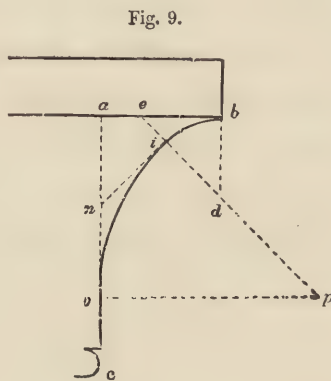
equal to cb; draw be at right angles to bc, and de at right angles to cd, from the point, e, as a centre, describe the arc, bd; this completes the contour of the moulding, bdf.

These are the simple Roman forms of the conge. It is obvious that the curve may be varied into a combination of arcs of different radii, in the same way as the cavetto—fig. 9—which would render it more appropriate for Grecian profiles.

The *cymatium*, or *ogee*, is the term applied to a moulding of which the section is compounded of a concave and convex surface. There are two species of cymatium: the cyma recta, or simply, the cyma, and the cyma reversa or talon. The Roman cymatium is usually composed of circular arcs, which may either be equal to or less than a fourth of a circumference. Thus, in the accompanying figures, 12 and 13, the former of which represents the cyma recta, and the latter the talon, let a and b be the extremities of the curve, join ab and bisect, or divide it equally at the point, c; from the points a and c as centres, with the same radius, describe arcs cutting at the point, ed; likewise, from the points, b and c, as centres, with the same radius, describe arcs cutting at the point, e; from the points, d and e, thus found, as centres, describe the arcs, ac and cb; then the curve of double flexure, acb, fig. 12, is the cyma recta, and the curve, acb, fig. 13, is the cyma reversa or talon. In the former, it will be observed, the concave portion of the surface is uppermost, whereas in the latter it is undermost. If the curve is required to be made quicker, a shorter radius than ac or cb must be used in describing the two parts of the contour. The projection of the upper end of the curve over the under, as nb, fig. 12, is generally equal to the height, an, of the moulding.
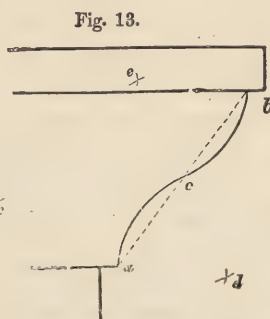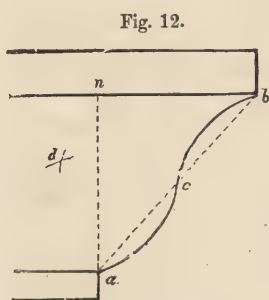
The Greek cyma recta differs little from the Roman, except in that its projection over the under fillet is less than that of the latter, and that its curvature is also less. It may be described similarly to the Roman cyma (fig. 12) by means of circular arcs, described with radii of greater length than ac or cb. The nature of the Greek cyma reversa, or talon, is represented in fig. 14; the curvature of the moulding is much more deeply marked than that of the Roman talon. The concave portion, ae, is deeply indented, and the convex portion, bne, projects considerably, and is *quirked* or turned inwards at b. The following is a simple mode of constructing the moulding, first introduced by Mr. A. M. Nicholson:—Join the points, ab, the extremities of the curve; bisect ab at the point c; upon bc, as a diameter, describe the semicircle cdb, and on ae describe the

semicircle *a e c;* draw perpendiculars, *d o* and *c*, from any number of points in *b c* and *c a*, meeting the circumferences of the semicircles; from the same points draw a series of horizontal lines, as represented in the figure, equal in length to the corresponding perpendiculars, *o n* equal to *o d*, for example. The curve line, *b n e a*, traced through the extremities of the lines, will be the contour of the moulding.

Fig. 14.

The curve might be rendered flatter by using arcs of circles of a diameter greater than *a c* or *c b*, as, of course, the height, *o d*, of the arcs would not be so great as it is in the figure; this will be exemplified in describing fig. 17, which follows; also, if the upper part, *b n c*, be required to be larger than the under part, *c a*, of the contour, this may be effected by shifting the point, *c*, nearer to *a*, before drawing the circular arcs.

The cyma, like the cavetto, is always used as a finishing, and never applied when strength is required, as it is weak in the extreme parts, though it is applicable as a means of shelter to crowning members. The talon, on the contrary, strong towards its extremity, is, like the ovolo, well adapted for supporting weight.

The *scotia*, fig. 15, like the fillet, is employed in bases to separate, contrast, and increase the effect of other mouldings, and conveys a graceful turn to the profile. To describe the scotia, the extremities, *a* and *b*, of the moulding being given:—Draw the perpendicular, *a c*, then *b c* is the projection of the moulding; draw the perpendicular, *b e;* add one-half of *a c* and two-thirds of *b c* into one length, which set off from *b* to *d;* from the centre, *d*, with the radius *b d*, describe the semicircle, *b f e;* join *e a*, and produce it to *f;* then join *d f*, cutting *a c* in *g;* from *g*, as a centre, describe the arc *a f;* this arc, in conjunction with *b f*, completes the contour, *a f b*, of the scotia.

Fig. 15.

Another mode of describing the scotia is represented in fig. 16. Join the extremities, *a* and *b*, and bisect *a b* in *c;* draw *e c d* horizontally, and make *c d* equal to the required recess of the curve, and *c e* equal to *c d;* draw *f d g* parallel to *a b;* divide *a f* and *a c* into the same convenient number of equal parts, and to the points of division in *a f* draw straight lines from *d;* draw also straight lines from

Fig. 16.   Fig. 17.

e, through the points in *a c*, till they meet successively the lines drawn to *a f*. Having performed the same operation on the upper side, the series of intersections thus found are points in the curve, and by tracing a line through them the contour will be completed.
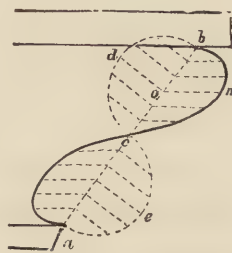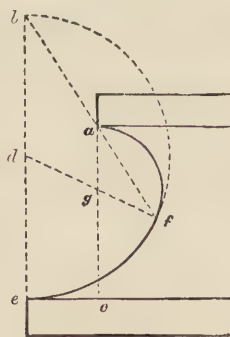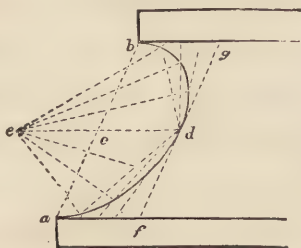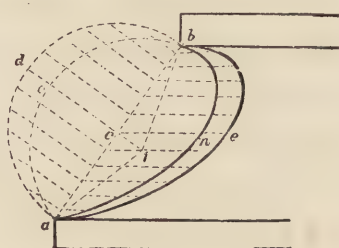
In fig. 17, a method is given in some respects similar to the preceding. Having joined *a b*, describe upon it the semicircle, *a d b;* from the centre, *c*, draw a series of lines perpendicularly from *a b*, meeting the circumference, *a d b;* draw also a series of horizontal lines from the same points in *a b*, as shown in the figure, making these lines equal to the corresponding lines in the semicircle, *c e* equal to *c d*, for example; the extremities of these lines will be as many points in the curve. If the recess of the curve is required to be less than *e c*, as, for instance, *c n*, then set off *c o* equal to *c n*, and describe an arc, *a o b*, from the centre, *i*, which will be found after one or two trials; performing the same operation as in the other case, we find the contour, *a n b*.

In comparing these three modes of describing scotias, it is to be remarked that the second is the most generally applicable, whether the recess and the projection be great or small compared with the height. In the third mode, when the projection is small, the form of the curve approximates to that of the circular arc employed in describing it. Both of these modes of description are applicable to mouldings of any recess and projection. The mode first described, to produce graceful contours, should be confined to those of medium proportions, when, for example, the projection is two-fifths of the height, as in fig. 15.

The shaft of a column, like the mouldings which constitute the other portions of the column, may be described with various contours. The shaft is never cylindrical, that is, of equal diameter throughout; it is always tapered to a certain extent towards the upper end. The degree of taper is termed the diminution of the shaft; the diminution usually applied to columns ranges between one-fourth and one-sixth of the diameter at the bottom of the shaft. The following simple modes of diminishing the shaft of a column may be applied, when the diameter at the top and bottom are determined :—

Let the vertical line, A B, Plate A, fig. 1, be the altitude of the column, and B C the half diminution at the upper end of the shaft; divide A B into any number of equal parts, A *a*, *a b* . . . and also B C into the same number of equal parts, B 1, 1 2, . . . draw the horizontal lines, *a f*, *b g*, . . . and draw other lines from the points 1, 2, . . . slanting towards A, to meet the horizontal lines respectively at the points *f*, *g*, *h*, . . . that is, the line drawn from 1 towards A, to meet the line *a f* at the point *f*, the line from 2, towards A, to meet *b g* at *g*, and so on; the points, *b*, *c*, *d*, *e*, and *f*, thus found, will be points in the contour of the shaft, and by joining them into one bent line, A *f g h i k* C, this line will be the contour, or entasis, as it has been termed, of the column.

But suppose that less swell or bulging is to be given to the shaft; then, in fig. 2, divide A B, as before, into a number of equal parts, and B C into two equal parts at D; divide D C into as many equal parts as A B; then proceed, exactly as in fig. 1, to find the points, *f*, *g*, *h*, *i*, *k*, in the contour. This will obviously bring the outline nearer

to a straight line from A to B. In this figure, E F is supposed to be the axis or centre line of the column, E G and E A being the semi-diameters at the bottom, and F N, F C, the semi-diameters or radii at the top. To explain a third mode of determining the entasis of the shaft: On A G as a chord, describe the circular arc, A O G, proportionally less than a semicircle, as the swell is intended to be less; from the point N draw the vertical line, N P, parallel, of course, to E F; divide the arc, G P, into any number of equal parts, G 1, 1 2, 2 3, . . .; divide the altitude, E F, into the same number of equal parts; through the points of division draw the horizontal lines, f l, s m, h n, . . . and draw the vertical parallel lines, 1 l, 2 m, 3 n, . . . meeting the others respectively at the points l, m, n, o, p; the curve line drawn through these points will be the entasis of the column.

In many instances the shafts of columns are not finished with plain round surfaces; their surfaces are frequently *fluted*, that is, indented by longitudinal flutes or grooves, throughout the whole extent of the shaft. The flutes, when cut, are applied entirely round the shaft, and their profile, which is shown by the section of the column, taken horizontally, is generally an arc of a circle, equal to, or less, than the semi-circumference.

There are two varieties of fluting represented in profile in figs. 3 and 6, Plate A, and shown also in elevation by figs. 4, 5, and 7, 10. In figs. 6 and 7, it will be observed that the flutes are regularly separated by fillets; while in figs. 3 and 4, no such intervention exists, the flutes meet each other edge to edge, and form a sharp angle or arris at their junction; the intervention of the fillets, as they strengthen the projecting angles, permits of the flutes being cut much deeper than when they follow each other consecutively. The circumferences of fluted columns are always measured, in the one case, over the exterior surfaces of the fillets, and, in the other, over the angles formed by the flutes.

To describe the flutes of a column without fillets: Let A B, fig. 3, be the diameter of the shaft at the lower end; bisect A B at G, and describe the semicircle A E F B; draw A D and B C perpendicular to A B, and D C parallel to A B, touching the circle; draw also D E G and C F G to the centre; divide the semi-circumference into half as many equal parts as there are flutes in the whole circumference; more particularly, let there be twenty flutes in the circumference, then ten of these are due to the semicircle, A E F B, and they ought to be so disposed as to have nine of them whole, and the tenth divided between the two extremities, A and B, in order that a flute may stand directly in front, as seen in the figure, where the line, D C, touches the circle. To this end, then, divide the arc, E F, into five equal parts, and continue the division towards A and B, making two whole divisions and a half, as F d and d c, and c B.

C

These points of division determine the arrises of the flutes. To strike the form of the flute, describe arcs from the centres, *c* and *d*, with the radius, *c d*, intersecting at *e;* from *e*, with the same radius, describe the concave surface, *c d;* this forms the flute —the same process is applied to find the others. Having drawn the concentric semi-circle, *a b*, for the diameter of the shaft at the upper end, if radial lines be drawn from the arrises of the flutes in the circle, A E F B, towards the centre, G, the points at which they meet the circle, *a b*, will be the arrises of the fluting at the upper end of the shaft, which is described similarly to that at the bottom. The figure, as now completed, becomes a half-plan of the shaft of the column. Fig. 4 is a bottom eleva-tion of the column, derived from the plan, as indicated by the dot lines; and fig. 5 is a top elevation.

To describe flutes with fillets in the shaft of a column: Let A B, fig. 6, Plate A, be the diameter of the column; bisect it at G, and describe a semicircle, as before, upon the diameter, A B; draw A D and B C perpendicular, and D C parallel to A B, touching the circle; join D G and C G. Let there be twenty-four flutes in the circumference; there will then be eleven whole and two half flutes in the semi-circumference, and five wholes and two halves in the quarter-circumference. If, therefore, this space be divided into six equal parts, the points of division will be the centres from which the flutes are described, and by running on the divisions to the points A and B, the centres for the whole semi-circumference will be ascertained, and will divide it into twelve equal arcs. Take any one of these arcs, F *d*, and divide it into five equal parts; then, with two of these parts as a radius, from each of the aforesaid centres, describe a semicircle; this will be the section of the flute; the flutes of the interior circle, representing the upper diameter of the shaft, are found by drawing radial lines, which appears sufficiently obvious from the figure. Figs. 7, 8, and 9, are elevations of the bottom of the column, as found from the plan by means of the dot lines; fig. 9 represents the most usual mode of finishing the flutes at the bottom of the shaft; fig. 10 is the corresponding elevation of the upper end.

In describing by relative dimensions the proportions of each particular order of architecture, it is desirable, for the sake of perspicuity and facility of reference, that in all the orders one common standard of measurement should be adopted, to which the proportional dimensions of all the parts of each order should be referred, being expressed in parts of that standard. For this purpose the diameter of the shaft of the column at the base, in each order, is taken as the standard of reference for all the parts or members of the particular order. The advantage of this is twofold; for, first, the proportions of an order are seen by a few glances; and, secondly, the relative propor-tions of corresponding parts in different orders are likewise readily ascertained. On this

principle we shall proceed in defining the orders separately. The diameter at the base, in each order, is divided into 60 equal parts, denominated seconds, and constituting the scale of parts for the particular order; this affords a ready means of accurately noting the proportions, which are expressed in seconds and fractions of seconds, when these occur.

OF THE GRECIAN DORIC ORDER.

This order, illustrated by Plate A, is the most ancient of the orders, and, while employed by the Greeks, was without a base. The surface of the shaft is usually worked into twenty very flat flutes, meeting each other at an edge—this will be explained by the half-plan given in the plate. The edge is sometimes a little rounded; the upper member of the capital is a square abacus or thin plinth, under which there is a large and elegant ovolo of great projection; on the base or lower part of the ovolo there are three fillets, or annulets, which project from the surface of the ovolo, and have, of course, equally recessed spaces betwixt them; the flutings of the column terminate on the under sides of the lowest of these fillets, being finished by a cavetto or a conge. The general outline formed by the junction of the conge with the ovolo, constitutes a cyma-reversa, the effect of which is most graceful.

The architrave consists of one vertical face, with a continuous band or fillet at its upper edge; to the under side of this band are suspended a series of smaller fillets, with drops or guttæ; these fillets are of the same length as the breadth of the triglyphs in the frieze, and are placed exactly below them.

The frieze consists of rectangular projections and recesses, placed alternately. The projections or tablets are diversified on the face by two vertical channels, and two half ones cut on the right and left edges, constituting three whole channels, and hence called *triglyphs*. The square spaces alternating with the triglyphs are named *metopes*, and are frequently decorated with sculptures.

The cornice is distinguished by a conspicuous *corona*, a term applied to a vertical or inclined plane surface which considerably overhangs the members underneath. To the corona, immediately over the triglyphs, blocks named *mutules* are suspended, of which the soffit or under side is inclined downwards from the roof; the mutules are also furnished with guttæ or drops depending from their soffits.

The proportions of the different members of the Doric order, as practised by the Greeks, range within considerably wide limits. The following are the average proportions for the members of the order. Taking the diameter at the bottom of the shaft as the standard of measurement, the column is six diameters in height. The diameter at the

upper end of the shaft is three-fourths of a diameter; that is, the shaft diminishes one-fourth of the diameter.   The height of the capital is half a diameter; that of the ovolo, including the annulets, and that of the abacus, are each one-quarter of the upper diameter, the annulets together being one-fifth of one of the parts.   The horizontal dimension of the abacus is six times its height.

The height of the entablature is one-third of that of the column, or two diameters. If it be divided into eight equal parts, these are distributed between the architrave, the frieze, and the cornice, in the proportion of 3, 3, 2 : thus, the height of the architrave is equal to that of the frieze, and that of the cornice is two-thirds of either.   The inner edge of the triglyph at the angle of the building is in a vertical line with the axis of the column; the breadth of the triglyph is three-fifths of its height, which is also that of the frieze, and the breadth being divided into nine equal parts, two are occupied by each glyph or channel, one by each semiglyph, and one by each of the three interglyphs, or flat surfaces between the glyphs.
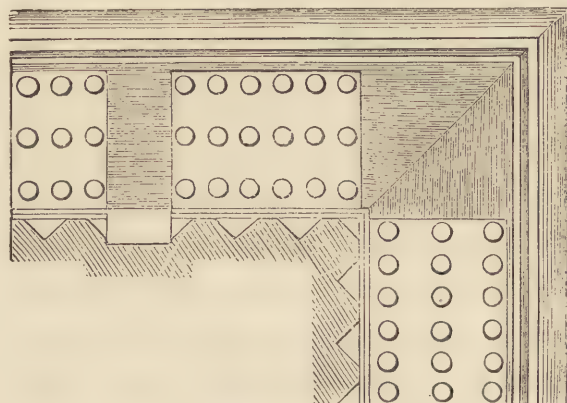
All this is shown in the annexed figure, which is a horizontal section of a portion of the entablature, viewed from below, and taken through the frieze.   It exhibits the section of the triglyphs, as well as the arrangement of the mutules in the cornice, with their drops. The metopes are square; the height of the capital of the triglyph is one-seventh of its whole height, and that of the metope one-ninth.   The height of the cornice being divided into five equal parts, the lowest is given to the fillet, the mutule, and the drops; the next two to the corona, and the remaining two parts are subdivided and disposed of as shown in the detail figure, Plate A.   The projection of the cornice over the capital of the triglyph is equal to its height; and being divided into four equal parts, three are given to the projection of the corona, and they are further subdivided as shown in the plate.

The number of annulets in the capital vary from three to five; and the number of horizontal grooves separating the shaft from the capital, vary from one to three.

In the scales which we have attached to the outline drawing of the order, three sets of dimensions are given, the nature of which is indicated by the initial letters at the bottom of the scales.   The first scale contains the "particular heights" of all the members of the order, expressed in seconds, each figure standing opposite the member to which it refers.   The second scale contains the "general heights" of the members, each division of the order being specified.   The third scale contains the "projections" of all the particular members, beyond the centre line of the column, expressed in seconds.

OF THE GRECIAN IONIC ORDER.

The Ionic order, like the Doric, may be primarily divided into column and entablature; in its secondary divisions, however, a new element is introduced, as, besides the shaft, capital, architrave, frieze, and cornice, it is provided with a base to the column.

The origin of the Ionic order is problematical; its capital, which is its principal characteristic, has been compared to the curls in the head-dress of females, to the spiral horns of rams, the bark of some trees when dried in the sun, the form of various sea-shells, and so on. The order is a medium between the grave solidity of the Doric, and the elegance and delicacy of the Corinthian.

In the architrave and frieze, all appearances of triglyphs and guttæ are omitted: in the cornice, instead of the bold mutules of the Doric, the ends of several pieces of wood are substituted, which are by way of support to the covering tiles, and are represented by dentils or teeth. The other portions of the cornice are analogous to those in the Doric, and consist principally of a cyma, ovolo, and cornice. The great recess of the mouldings under the cornice gives it a striking prominence; this relieves its apparent heaviness, though both the dentil band and the cymatium of the frieze are introduced under it.

The base of the column consists of two tori, separated by a scotia, with fillets, and a square plinth, on which the column rests; though in some cases the plinth is dispensed with, and the column stands immediately upon the general platform which supports the whole.

In the volute of the capital, the lower edge of the channel which runs between the upper and under spirals is formed into a curve bending downwards in the middle, and revolving about the spirals on both sides. The volute rests upon the ovolo, astragal, and fillet, which terminate the shaft. The ovolo is always cut into eggs, surrounded by borders, with tongues between them. The shaft is, in general, cut into twenty-four flutes, with fillets between them, and the flutes are sometimes made with an elliptical section, which makes them flatter than when they are circular. The taper of the shaft is also less than that of the Doric.

Besides the special dimensions, given in Plate B, of the Ionic order, the following may be noted as the general proportions of the order. The column is eight and a half diameters in height; the diameter of the upper end of the shaft is five-sixths of a diameter; the taper of the shaft is one-sixth. The height of the base, including the plinth, is half a diameter; the heights of the tori and the scotia are nearly equal; the upper fillet of the scotia projects as much as the upper torus. The projection of the lower torus beyond the

D

lower radius of the shaft, is one-fifth of a diameter. The height of the capital is half a diameter; the height of the volute is seven-twelfths of a diameter; dividing the height of the volute into three equal parts, the top of the lower one reaches to the bottom of the ovolo, and the second division to the top of the festoon, on the axis of the column. The curvature of the outer spiral springs immediately from the ovolo with which the volute is crowned.

Dividing the whole height of the order into twenty-one parts, four of these go to the entablature, which is, therefore, two diameters in height; the height is equally distributed between the architrave, the frieze, and the cornice. Dividing the height of the architrave into four parts, one part is due to the mouldings of the upper portion or capital; subdividing the capital into nine equal parts, give one to the upper fillet, three to the cavetto, four to the ovolo, and one to the bead. Divide the height of the frieze into six equal parts, and give the upper part to the talon, which forms the capital. Divide the cornice into three equal parts; subdivide the upper and lower thirds, each into six parts; in the upper third, give one part to the upper fillet, four to the cyma-recta, and one to the lower fillet, and turn one down into the middle third, for the ovolo under: dispose of the parts in the lower third as appears by the scale.

The projection of the cornice over the cymatium of the frieze is equal to its height; the projections of the subordinate members will be obvious at once from the scales attached.

The volutes of the Ionic capitals are composed of two or more spirals of the same kind, which, after making a number of revolutions, terminate at the centre upon a central point resembling a button, denominated the eye of the volute. The spirals, which project from the surface to give them relief, are termed the *hems* of the volute : the interspaces being called the *channels*.

These definitions will be understood on referring to the detail drawings of the Ionic order, in Plate B. There the front elevation of the capital is represented, showing the central eye, and the spirals terminating in it. The back elevation of the capital is the same as the front. The flanks, shown as side elevations in fig. 1, Plate B, have somewhat the appearance of a baluster. In the plan, fig. 2, this portion of the capital, supposed to be viewed from the under side, appears square in its general outline. Fig. 3 is a vertical section of the capital, exhibiting the profile in flank; fig. 4 is a vertical section, drawn to the same centre line, and in a plane at right angles to that of the preceding section, exhibiting the contour of the front and back elevations of the capital. From these figures it will be observed, that the volutes fit like a cap upon the circular tablet formed by the ovolo. There are no precise rules for the form of the capital in flank, except, perhaps, that the parallel beads which decorate the scroll should run directly into the

interspaces of the carvings upon the ovolo; otherwise, the configuration of the parts is left to the taste of the designer. The shaft of the column has been represented fluted in these details, that the correspondence of the flutes with the carvings upon the ovolo may be shown.

To describe the Ionic volute: the number of revolutions or quarters of which the spirals are to consist being given, the vertical height, also, of the spiral, and the diameter of the eye:—Let A B, Plate B, fig. 5, be the height of the volute, and let the spiral make three revolutions, consisting, therefore, of twelve quarters; bisect A B at the point C, and from A B cut off A D, equal to the given radius of the eye; divide D C into as many given parts as there are quarter revolutions in the spiral to be drawn (which in this case are twelve in number), at the points 1, 2, 3, . . . 11, 12. To prevent confusion, we have indicated this division upon a parallel line, D' C'; draw C E at any angle with C D, and make it equal to two of these parts; join D E, and from the points 1, 2, 3 . . . draw straight lines, 1 F, 2 G, 3 H, parallel to C E; taking $c\,d$ equal to one part, draw $d\,f$ perpendicular to A B, and equal to 12 E; draw $f\,g$ perpendicular to $d\,f$, and equal to 11 Q; draw again $g\,h$ perpendicular to $f\,g$, and equal to 10 P. Proceed in this manner until all the sides of this winding fretwork are drawn; then, the points $d, f, g, . . . p, q, r$, so found, are the centres from which the quadrants which compose the spiral must be successively described. For this purpose, produce $d\,f$ to 1, $f\,g$ to 2, $g\,h$ to 3, and so on; the quadrants, as they are described, will be limited by these lines; from the centre, d, with the radius, d B, describe the quadrant, B 1; from the centre, f, with the radius, f, describe the quadrant, 1, 2; from g, with the radius, g 2, describe in like manner the quadrant, 2, 3; proceed in this way till the last arc, 11, 12, is described from the centre, q, with the radius, q 11; then, finally, describe the circle at the centre, from the point, r, and with the radius, r 12. If the operation be accurately performed, this radius, r 12, will be equal to A D, as required, and the spiral line will be completed.

But as the process, as it is now described, is very liable to inaccuracy, the method of finding the centres shown on a larger scale at fig. A, is at once more expeditious and more certain. Having drawn $d\,f$ perpendicular to the vertical line, bisect it at e; draw $e\,r$ perpendicular to $d\,f$, equal to $d\,e$ or $e\,f$, and join $d\,r$ and $f\,r$; divide $e\,r$ into three equal parts, $e\,s, s\,t, t\,r$, and draw $i\,s\,k$ and $n\,t\,o$ parallel to $d\,f$; draw $f\,g$ perpendicular to $d\,f$, and equal to 11 Q; draw $g\,h$ and $i\,h$ respectively parallel and perpendicular to $d\,f$, meeting at the point h; draw the diagonals $g\,p$ and $h\,q$ parallel to $d\,r$ and $f\,r$, and draw the perpendiculars $k\,l, o\,p, r\,q, n\,m$. In this way all the centres are determined, namely, $d, f, g, h, ... o, p, q, r$.

To describe the second spiral line, which, with the first one, comprehends the thickness

of the hem, a similar process is applicable.　　Set off B R for the thickness of the hem at that part, and, supposing the hem to diminish in thickness by equal amounts for each half revolution, divide B R into six equal parts; as the spiral describes six half revolutions, it will diminish in thickness one-sixth of B R for each half revolution; set off, therefore, A S equal to five-sixths of B R, then R S is the height of the second spiral.　　Bisect R S at T, and set off S V equal to the radius of the eye; then, dividing T V into twelve equal parts, the method already described for finding the centres may be applied.

The method already described, though it is well adapted to the description of the single spiral, is not applicable where there are many spirals.　　In this case, the principle of the logarithmic spiral may be employed.　　The nature of this spiral is such, that being divided into equal angular segments, as quadrants or half quadrants, its distances from the centre, at the ends of the segments successively, decrease in a geometrical ratio.

To describe the Ionic volute, on the principle of the logarithmic spiral: the centre, the vertical height, and the distance between the first and second revolutions of the outer spiral being given.

Definition.—The vertical line O A, fig. 6, drawn from the centre O of the spiral, and expressing also the height of it above the centre, is termed the *cathetus*.

If then O A be the cathetus, O the centre, and A I the distance between the first and second revolutions, produce A O to E, and draw G O C at right angles to A E; bisect the angles at the centre by the straight lines B O F and D O H; find a mean geometrical proportional between O A and O I, and make O E equal to it; find also a mean proportional between O A and O E, and make O C equal to this mean.　　Having thus found the consecutive points A, B, and C, the distances of which from the centre are in geometrical progression, the others in succession will be found by the aid of proportional compasses. Having set the compasses, so that the ratio of the lengths of the legs on the opposite sides of the centre pin may be that of O A to O B, it is obvious that if the distance A O, be taken between the longer ends, the shorter ends will measure the distance B O; and, in like manner, that if the longer ends be set to B O, the shorter ends will measure C O. Farther, by taking C O in the one end, we have D O in the other; and proceeding in this way, we may find successively the distances E O, F O, G O, &c., which furnish as many points in the spiral; and, by tracing a curve line through the points thus found, the spiral will be completed.　　The divisions marked off upon the line A G indicate the commencements of the other spirals, of which the volute consists, which, it will be observed, are disposed in three sets.

Another method of setting off the spiral by means of proportional compasses, without pricking the paper, is to construct a scale of parts A B O, fig. 7.　　This method also expedites the process considerably.　　Having found O A and O B, as before, and set the

compasses in the manner already described, make o A, fig. 7, equal to o A, fig. 6, by the longer ends of the compasses, and mark off o b, the distance between the shorter ends. Take again o b, between the longer ends, and mark o c, between the short ends; similarly, from o c find o d, and so on, till the distance, o i, is found. And here the accuracy of the process may be tested, as o i, fig. 7, should be equal to o I, fig. 6. Join the points of division in A i to the point B; draw the horizontal line i E, and from E draw the vertical E F, cutting i B at the point G; draw again the horizontal and vertical lines G H and H K I. Then the three scales A O, E F, and H I, will afford eight points in each of the three revolutions of the first spiral A C E G I: o b is equal to O B, o c equal to O C, o d equal to O D, and so on; and lastly o i or F E is equal to O I. Following the same process, the eight divisions on the scale F E give eight points in the second revolution I K L, and the scale I H gives eight points to the third revolution L M N.

The points thus determined for the spiral may be transferred to the edge of a slip of paper, and thence marked by a pencil point upon the drawing, fig. 6.

The same scale, fig. 7, may be employed for the other spiral lines in the volute, the commencements of which are marked on the line A I, fig. 6, for, by dividing the parallel line A i, which is equal to A I, in the same manner as A I, and drawing horizontal lines from these several points of division, as indicated in the figure by dot lines, the perpendiculars drawn from the points at which these lines meet A B, furnish scales for the first revolutions respectively. For example, if we draw a horizontal line L M, from the point L, meeting A B at the point M, the perpendicular M O N becomes a scale of parts for setting off the first revolution of the spiral which starts at the same point L, fig. 6. The scales P R Q and S U T, formed in the same manner as before, serve to define the second and third revolutions of the same spiral. In this way, then, it is clear we can readily construct a set of scales for each individual spiral. Another mode of finding a series of points in a spiral is represented by the scale, fig. 8.

Referring for convenience to fig. 6, divide the whole height A E into sixteen equal parts, making the portion A O above the centre equal to nine parts, and leaving of course seven for the portion O E. In fig. 8, make O E equal to O E, fig. 6, and draw a perpendicular O A equal to O A, fig. 6; join A E, and on E as a centre describe the arc A P; divide that arc into twenty-eight equal parts, and join the points of division to the centre E. The straight line A O intersected by these radii at the points, b, c, d, &c., forms the scale for the first spiral: thus O A is the distance O A, fig. 6; o b gives the distance O B; o c gives the distance O C; o d gives the distance O D, and so on; till lastly o n gives the radius O N of the eye, which is described by a circle on the centre O. Having thus marked off a series of points in the curve, it may be completed either by describing arcs of circles connecting the points which have been set off, or by tracing by hand a curve

E

line through them.   The other spiral lines of the volute may be described in like manner by making a new scale for each.

In this example, the radius of the eye has been made equal to the first four divisions of the line A, the remaining twenty-four divisions being distributed along the spiral.   We may, of course, secure any number of divisions for the radius of the eye; if we are to secure eight divisions, for example, then as twenty-four are due to the spiral, the arc must be divided into 24 + 8 or thirty-two parts.

OF THE GRECIAN CORINTHIAN ORDER.

The Corinthian is the third and last of the Grecian orders.   Upon this order the ancients lavished the utmost efforts of their creative genius; it is the most magnificent and elegant of the orders.

The great distinguishing feature of this order is its capital.   The capital consists of a solid body or nucleus in the shape of a bell, and hence commonly called the bell of the capital; the bell is surrounded with two tiers of foliage, consisting of acanthus leaves, of which there are eight in each tier; the upper end of the shaft finishes with an astragal, which appears to bind together the leaves at the roots; surmounting these are eight cauli-coli, or twisted and fluted stalks, springing from between the leaves of the upper tier, and spreading each into two open volutes, which support the abacus: the abacus consists of a square tablet, concave on the four sides or edges, and having the acute angles thus formed cut away; the edge of the abacus is wrought into an ovolo and a cavetto, separated by a fillet—one of the upper tier of leaves fronts each side of the abacus; the space beneath the abacus, unoccupied by the leaves, is taken up with slender caulicoli or stalks, which spring from between every two leaves, and proceed to the corners, and to the centres of the sides of the abacus, where they are formed into delicate volutes.   The centre of each side of the abacus is adorned with a rosette, or small flower.

The base of the column, as represented in Plate E, is the same as the Ionic base, consisting of two tori, separated by a scotia, the whole resting on a square plinth.   The shaft of the column should be fluted when the entablature is enriched.

In the cornice of the entablature the dentil band is preserved, as in the Ionic order, and is overhung by a fascia, from which enriched medallions project.   The entablature bears a close resemblance to that of the Ionic order.

The following are the general proportions of the Corinthian order:—In its general arrangement, it is similar to the Ionic: the column is ten diameters in height; the diameter at the upper end is five-sixths of that at the under end, the taper being therefore one-sixth.

The height of the base is half a diameter; the projection of its upper torus is equal to that of the upper fillet of the scotia. The height of the capital is $1\frac{1}{6}$ diameters, of which one diameter is occupied by the leaves and volutes, the remaining sixth being given to the depth of the abacus; the height occupied by the leaves and volutes being divided into three equal parts, the lower part is due to the lower tier of leaves, the second part to the second tier, and the third part to the caulicoli and volutes. The height of the principal volutes is three-fourths of one of these parts. The droop or descent of the tips of the leaves is one-third of the height assigned to them; their form is seen more explicitly in the engravings, which give the general form of the foliage before it is cut, in which fig. 1 is the elevation, and fig. 2 the semi-plan of the capital. It will be seen that the circumference of the bell is divided between eight leaves in each tier. The abacus, which is seen in both these figures, is supposed to be cut from a square plinth, shown in dot lines in the plan, the diagonals of which measure two diameters of the column; the curvature of each side is an arc of a circle, of which the centre is formed by constructing an equilateral triangle upon the side of the square, the vertex of the triangle being the centre. Figs. 3 and 4 show the general form and manner of raffling the leaves.
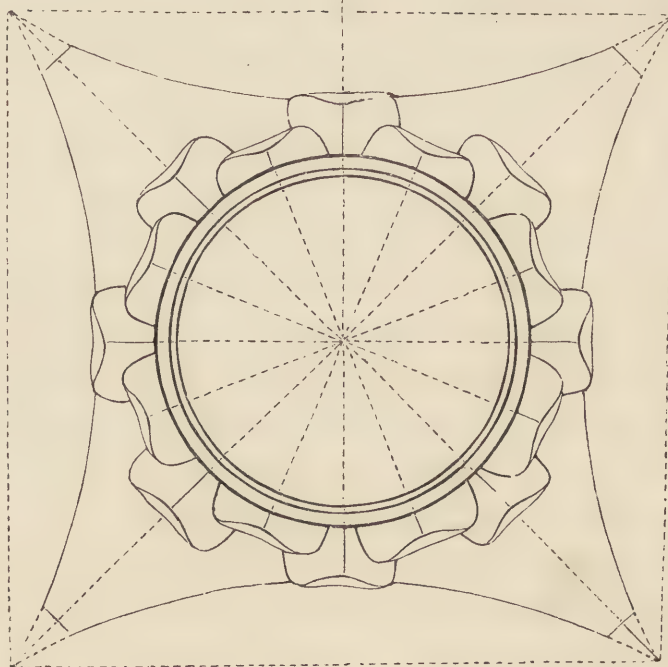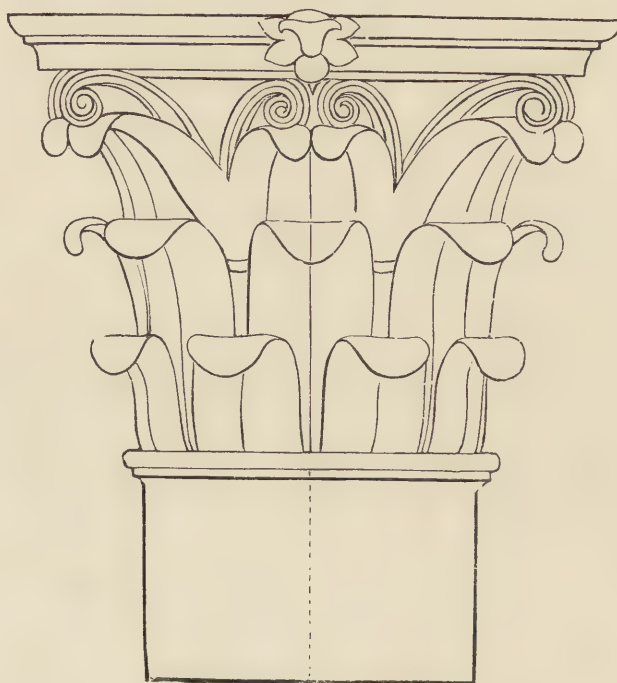
Dividing the whole height of the order into five parts, one of these is due to the

Fig. 1.

Fig. 2.

entablature, which is therefore one-fourth of the height of the column, or two and a half
diameters high.   The architrave is three-fourths of a diameter high, the frieze is two-
thirds, and the cornice one and a twelfth.   Dividing the height of the architrave into
five parts, one of these is due to the fillet, the quirked cyma-reversa, and the bead;
the other four parts are divided equally among the three fascia which compose the
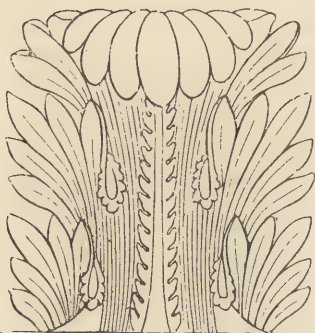
Fig. 3.   Fig. 4.   Fig 5.

remainder of the architrave.   The frieze is commonly ornamented, though frequently left
quite flat and plain.   The height of the cornice being divided into three parts, they
are disposed among the members in the manner exhibited by Plate C.   The projection
of the cornice over the frieze is equal to its height; the projections of the members of
which it is composed are given on the plate.   The modillions which overhang the
dentil band are represented in fig. 5.

OF THE ROMAN DORIC ORDER.

In the progress of their conquests, the Romans extended their dominions over the
colonies of Greece, over Greece itself, and over some parts of Asia.   It was not till
they had acquired the mastery of these, their more polished neighbours, that they
possessed any opportunity of becoming acquainted with the architecture of Greece, as
well as with its sculptures and paintings.   The columnar architecture of the Romans,
imitating that of the Grecians, is evidently of the same family, though greatly inferior
in simplicity and harmony.   The Doric order of the Romans, which we are now to
describe, affords an illustration of this remark; it strikingly contrasts with the simple and
energetic Doric of the Grecians, and is by no means an improvement on this beautiful
order of architecture.

The column of the Roman Doric had originally no base, but the addition of a base
is certainly an improvement, and renders the parts of the order consistent with one

another. The capital has a greater number of members than that of the Grecian, and are of a light and round character, while those of the other are broad and flat. The shaft is more slender than the other, and is very seldom fluted; when it is fluted, the flutes are separated by fillets, as in fig. 6, Plate A, and are twenty in number; the shaft is finished at the upper end with an astragal and a fillet, which support the capital, instead of one or more channels, as in the Grecian. In the capital, three fillets, with a quarter-round and a semi-torus, are intended to represent the ovolo and annulets of the Greek capital; and the height of the abacus, instead of being plain, is divided into a projecting fillet, a cyma, and a fascia.

The architrave is, like the other, furnished with a band along its upper edge, from which the fillets and guttæ depend. The guttæ, also, are six in number, but are coniform instead of cylindrical, and project from the surface of the architrave fully more than half their diameter. The face of the architrave is vertical, and stands in a line with the superior diameter of the column, though it is sometimes set a trifle within the point. In the frieze, the triglyphs project from, instead of being coincident with, the architrave; and those next the angle of the building are, as represented in Plate C, placed directly over the centre of the column, instead of being on the angle; the glyphs, of which there are two wholes and two halves, are finished square at the upper edge, and the tops slope downwards towards the back at the same angle with the sides.

In the cornice, the members are all lighter than those of the Grecian (there is, in fact, a greater subdivision), with the exception of the mutules, which are boldly developed, and have no guttæ.

Besides the special dimensions which we have given in Plate C, we may state the following general proportions of the order:—Dividing the whole height of the order into five equal parts, one of these is given to the entablature, the height of which is therefore one-fourth of that of the column. The column tapers one-sixth throughout the shaft, and is eight diameters high, of which one diameter is distributed equally between the capital and the base. The plinth in the base is one-third of the height. The height of the capital is nearly equally divided between the abacus with its mouldings, the ovolo with its fillets, and the neck.

The entablature is two diameters in height, and being divided into eight equal parts, these are distributed among the cornice, the frieze, and the architrave, in the proportions of three, three, and two. This distribution contrasts strongly with that of the entablature of the Doric. The height of the architrave, which is half a diameter, being divided into three, one of the parts is due to the band, fillet, and guttæ, of which the height of the band is equal to that of the fillet and guttæ together. The frieze is three-fourths of a diameter in height: it is divided horizontally into triglyphs and

metopes, of which the former are each half a diameter in breadth, and on the whole depth of the frieze—dividing the breadth of the triglyph into twelve parts, the extreme twelfths are due to the semiglyphs, and the remaining ten parts are distributed equally between the two whole glyphs and the three vertical plane surfaces, or *shanks*, which separate them, two parts being given to each member. The plat-band or fascia, which crowns the triglyph, is one-eighteenth of its height. The cornice is three-fourths of a diameter high. The breadth of the dentils is the same as that of the triglyphs, and their projection is equal to their breadth.

THE ROMAN IONIC ORDER.

The Roman Ionic is the modification of the original Grecian, practised by the Romans after their conquest over the Greeks. The general proportions of the Roman and Grecian Ionics are nearly alike; the minutiæ and detail, however, are considerably different. This will be perceived at once on referring to the Plates of these orders— Plates B and D.

In the column of the Roman Ionic, the attic base is always employed. The capital is considerably distinguished from that of the Grecian by the straightness of the under edge of the channel of the volutes over the quarter round, and the absence of the hem which bordered the under side of this channel in the Grecian. The shaft may be either plain or fluted, with twenty or twenty-four flutes, in plan a trifle more than semicircular. The fillets between the flutes should have between one-third and one-fourth of their width. The egg and dart ornament of the quarter round in the capital should correspond with the flutes of the column, there being an egg exactly over each flute, and a dart, of course, over each fillet. The volutes may be described according to the methods already given for those of the Grecian order.

Dividing the whole height of the order into five parts, one of these pertains to the entablature, the others to the column: the height of the entablature is, therefore, one-fourth of that of the column. The shaft of the column tapers one-sixth; the whole height of the column is nine diameters, half a diameter is given to the base, and seven-twentieths, or twenty-one minutes, to the capital.

The entablature is two and a quarter diameters high. Dividing its height into five equal parts of twenty-seven minutes, two of these parts go to the depth of the cornice, and the remaining three are divided equally between the architrave and the frieze. The faces of the frieze, and the lowest member of the architrave, are directly on the outline of the upper end of the shaft; this gives them a less heavy aspect than the

corresponding members of the Grecian, which project considerably. The projection of the cornice from the face of the frieze is equal to its height.

The Ionic entablature is occasionally reduced to two-ninths of the height of the column; this may readily be accomplished without altering its internal proportions, by making its module or scale of parts less, by one-ninth, than the diameter of the column, and setting off its parts from this scale in the proportions exhibited in the plate. In the decoration of the interior of apartments, when much delicacy is required, the height of the entablature may, according to Nicholson, be reduced to even one-fifth of the column, by observing the same method, and making the module only four-fifths of the diameter.

OF THE ROMAN CORINTHIAN ORDER.

This order, Plate D, is the only one in which the Romans have truthfully represented the original from which it is derived. In detail, this order is but slightly different from its prototype.

Dividing the whole height of the order into five parts, one part is due to the entablature, which is therefore one-fourth of the column, as in the Grecian. The height of the column is ten diameters, and the entablature, consequently, two and a half diameters. The cornice is one diameter, or two-fifths of the entablature, high; the remaining three-fifths are divided equally between the frieze and the architrave, three-fourths of a diameter to each. These general proportions, it will be observed, are the same as those of the Roman Ionic order. The entablature of the latter is frequently substituted in the Corinthian order.

THE COMPOSITE ORDER.

The Composite order is derived from the three original orders, or, more strictly perhaps, from the Roman Ionic and Corinthian, being a compound of the two orders. There are a great variety of designs recognized as the Composite order; we have given the design in Plate D from Chambers, who, in composing it, endeavoured to avoid the faults and unite the perfections of those with which he was acquainted. The entablature has one-fourth of the height of the column; the column is ten diameters high, consequently the entablature is two and a half diameters, of which the cornice has one diameter, and the frieze and the architrave each three-fourths of a diameter. The base is precisely the same as in the other orders: the shaft is fluted similarly to the Ionic;

the capital retains the two tiers of acanthus leaves in the Corinthian, and also the abacus in the same order; the Ionic scroll, however, is introduced between these members.   The cornice differs from the Corinthian only in having the medallion square, and composed of two fascias.

The entablature of the Composite order may be reduced to two-ninths of the column, which, to avoid fractions, may be called two modules and a half, taking the module at nine-tenths of a diameter.   If it be reduced to one-fifth, the module will be four-fifths of the diameter; where such a diminution is desirable, it will be preferable to adopt the Ionic cornice, which, consisting of fewer parts, will retain its due importance without affecting the mass.

THE TUSCAN ORDER.

This order is the fifth and last of the Roman orders.   It derives its name from the ancient Etruscans, who were employed by the Romans in building, and are said to have been its inventors.   Without any great stretch of comparison, the order appears to be a simplification of the Roman Doric, having little else to distinguish it from this order, besides its massiveness and plain appearance.

The total height of the order, Plate D, being divided into five equal parts, four of them are given to the column, and the other parts to the entablature.   The column is seven diameters high; it is thus shorter in proportion to its diameter than any other of the orders.   The capital is a semi-diameter high; the base, with the lower cincture of the shaft, is also half a diameter.   The entablature, one-fourth of the column, is one-and-three-quarters diameters high; it is divided in the same proportion as the other Roman orders, two-fifths of its height being given to the cornice, and the other three-fifths divided equally between the architrave and frieze.   The projection of the cornice over the vertical faces of the inferior members is equal to its height.

Fig. 1

Fig. 2

Fig. 5

Fig. 3.

Fig. 1.

Fig. 10.

Fig. 6.

Fig. 7.

Fig. 8.

Fig. 9.
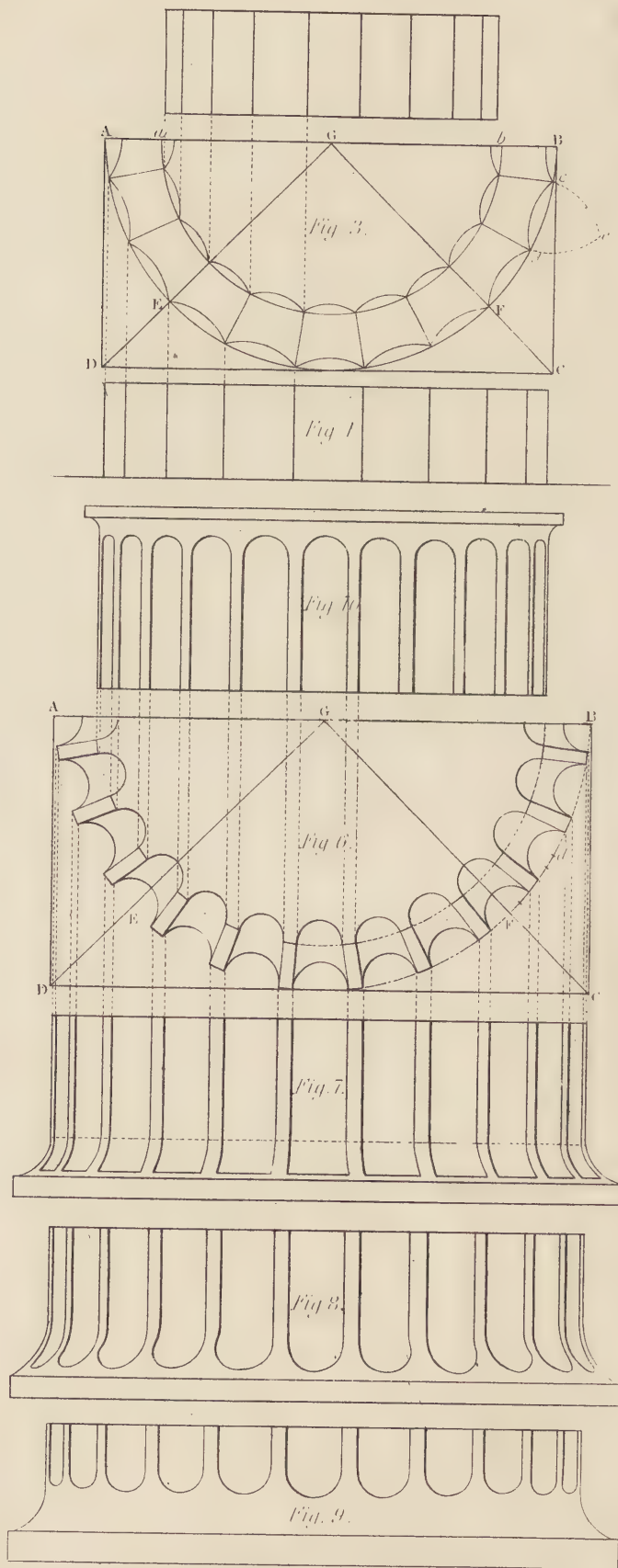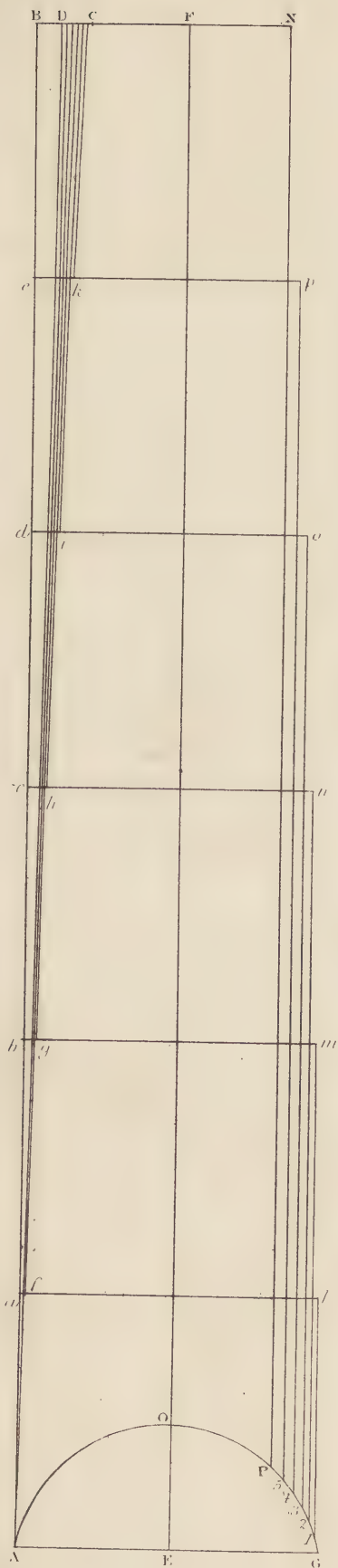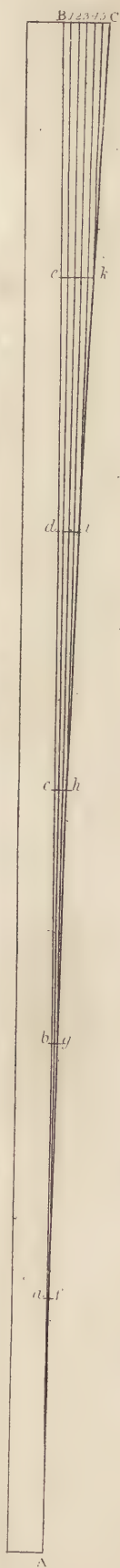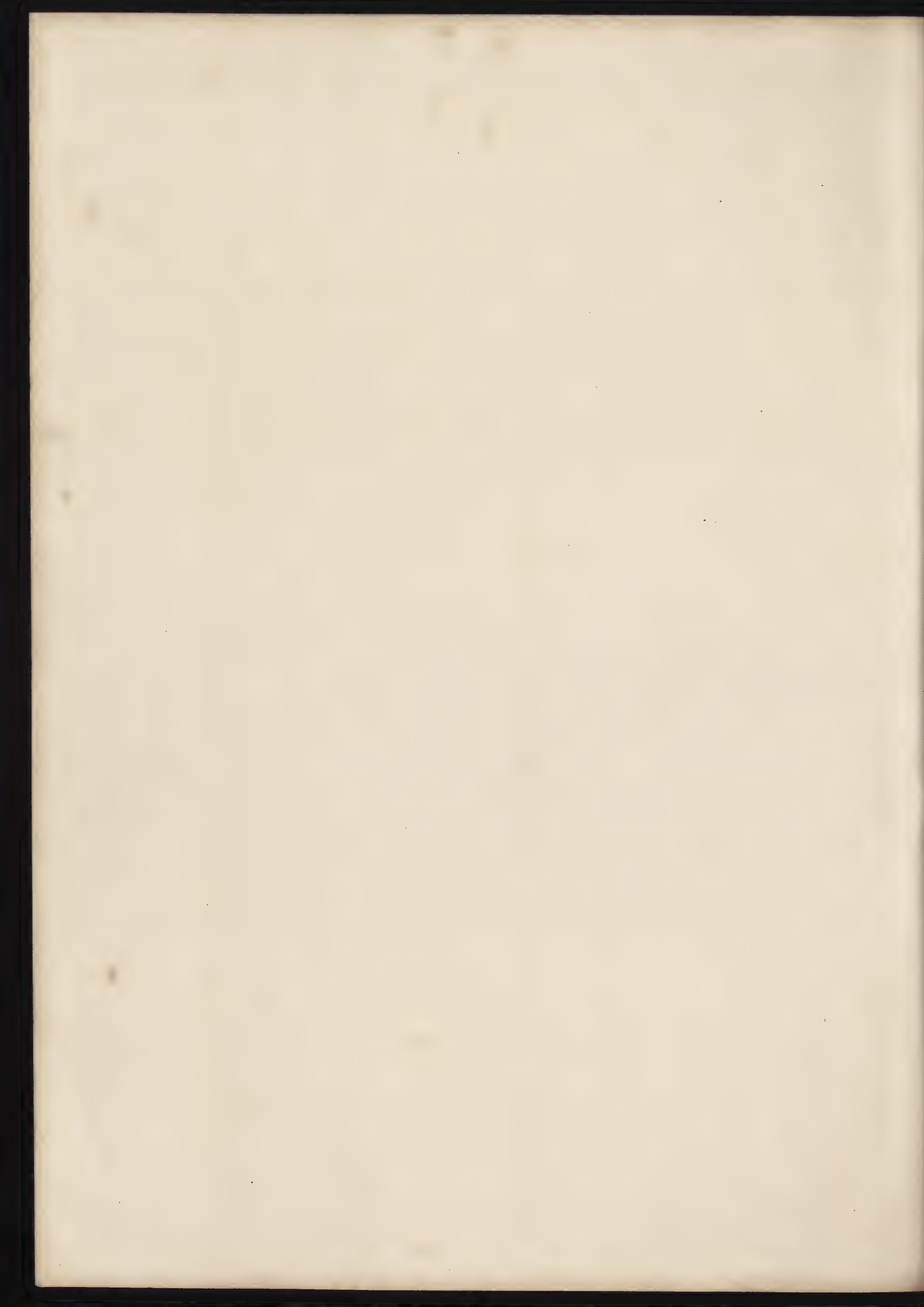
ORDERS OF ARCHITECTURE
GRECIAN DORIC ORDER.
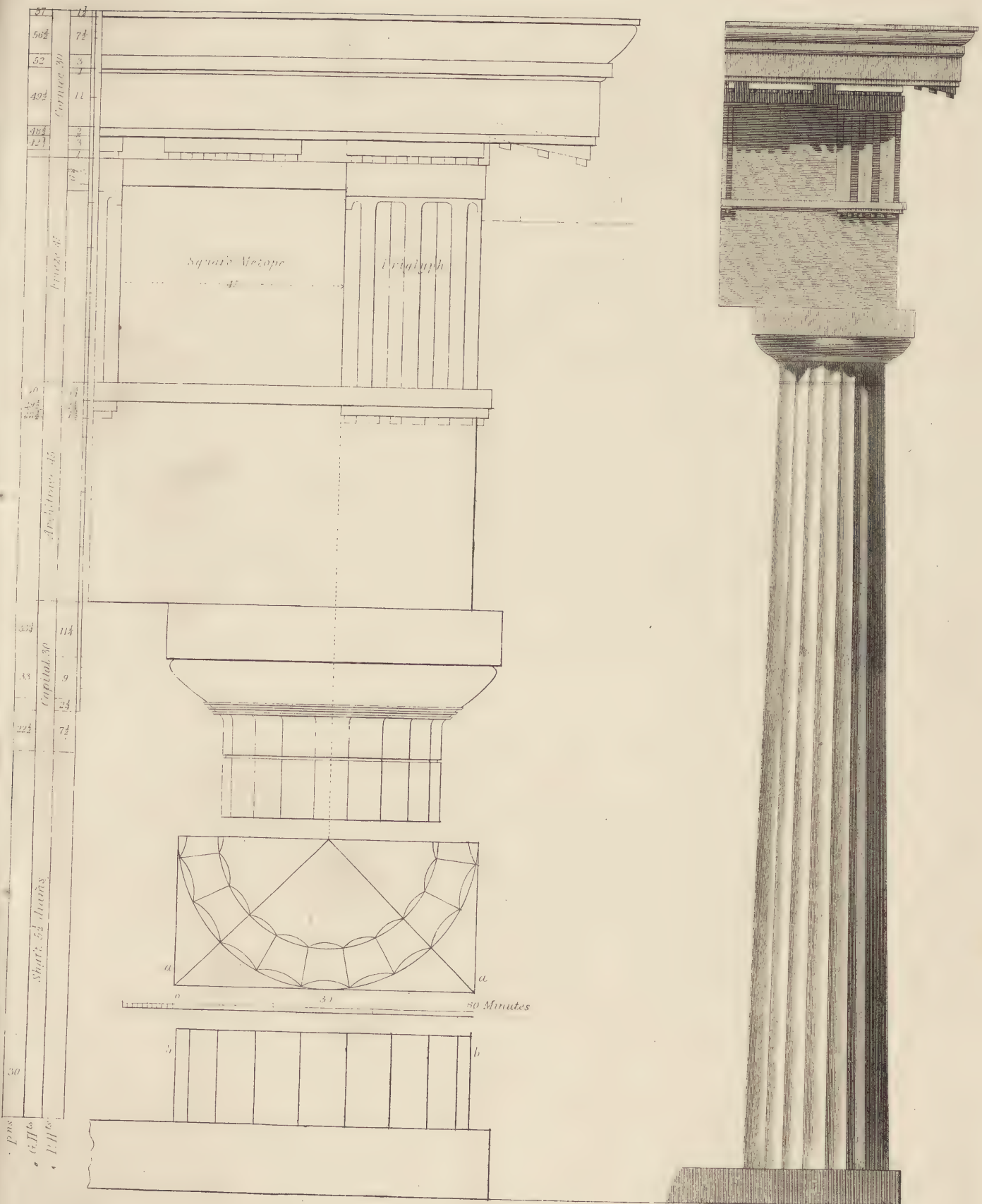
Square Metope

Triglyph

Cornice 30

Frieze 45

Architrave 45

Capital 30

Shaft 32 Minutes

60 Minutes

ORDERS of ARCHITECTURE

GRECIAN IONIC ORDER.

ORDERS OF ARCHITECTURE.
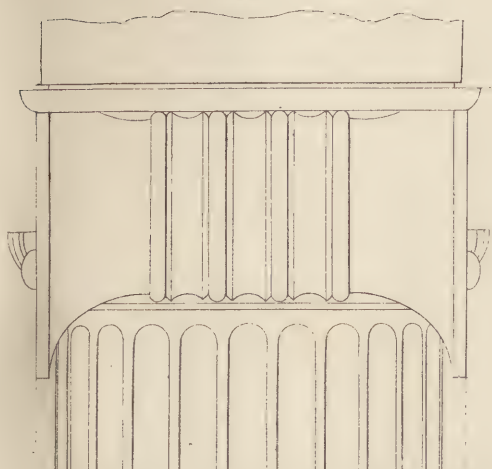
DETAILS OF IONIC ORDER.
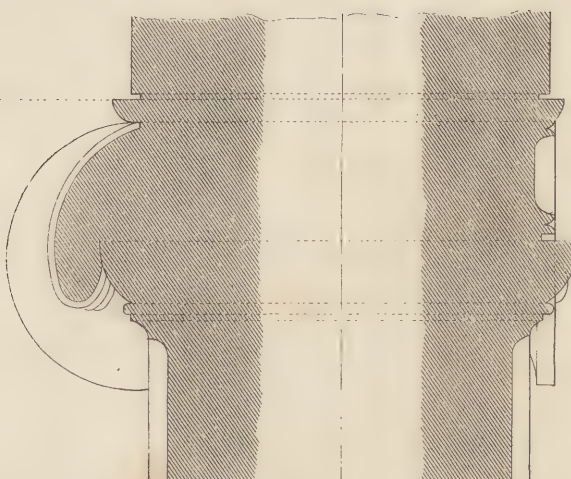
Fig 1.

Fig 3.

Fig 4.

Fig 2.
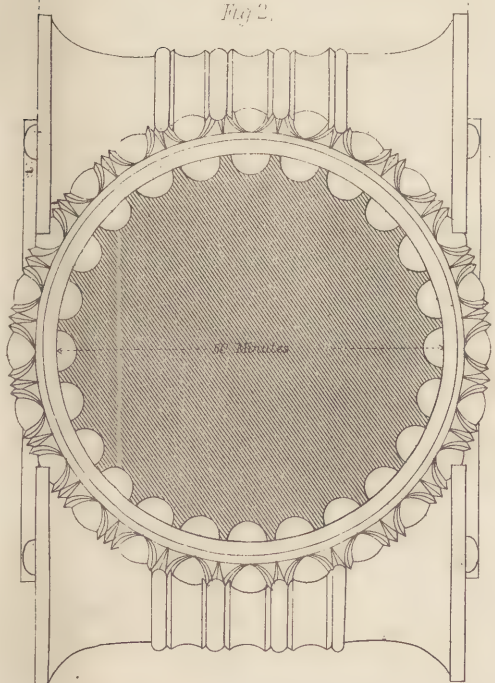
Fig 5.

Fig A.
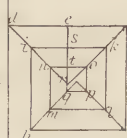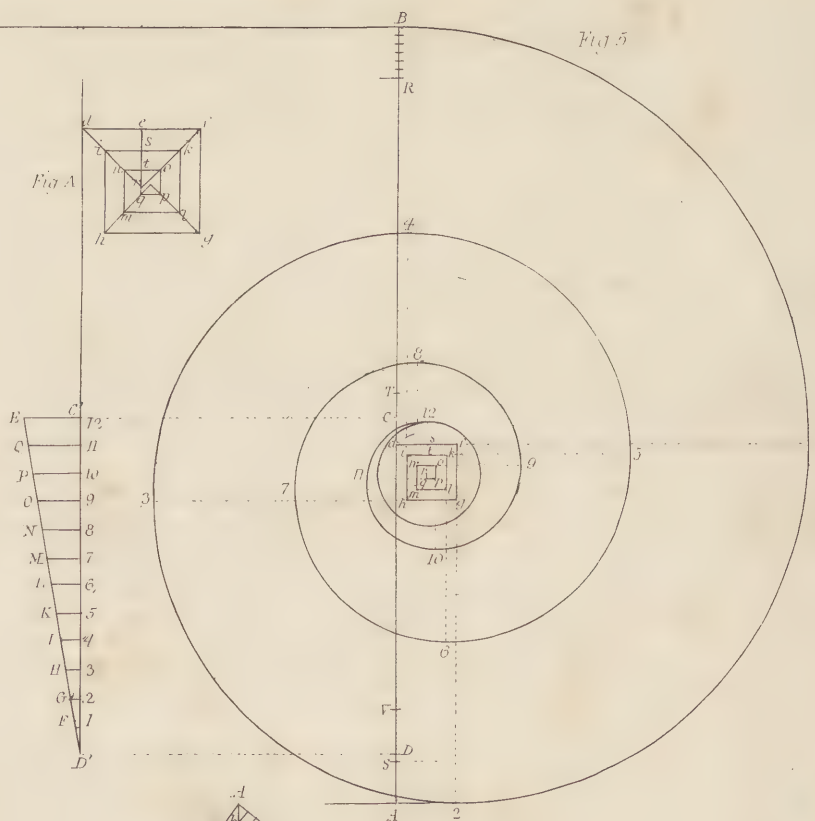
Fig.6.
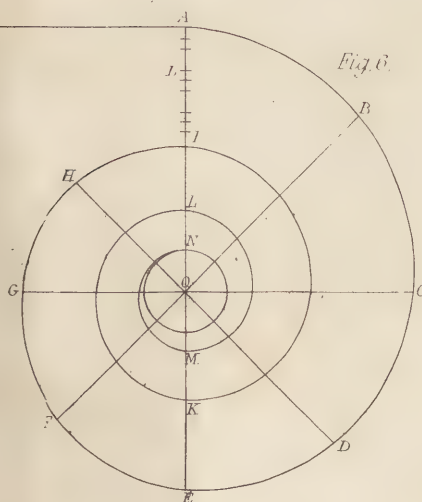
Fig 3.

Fig 7.

ORDERS of ARCHITECTURE
GRECIAN IONIC ORDER.

ORDERS OF ARCHITECTURE.

DETAILS OF IONIC ORDER.

Fig 1.

Fig. 3

Fig 4

50 Minutes

Fig 2.

Fig 5

Fig A

30 Minutes

Fig. 6.

Fig 8

Fig 7

ORDERS of ARCHITECTURE
GRECIAN CORINTHIAN ORDER.

ORDERS OF ARCHITECTURE

ROMAN DORIC ORDER.
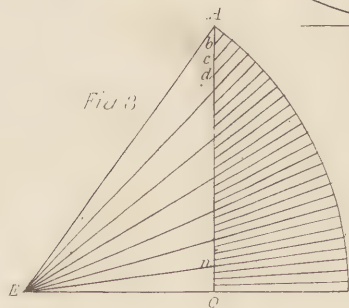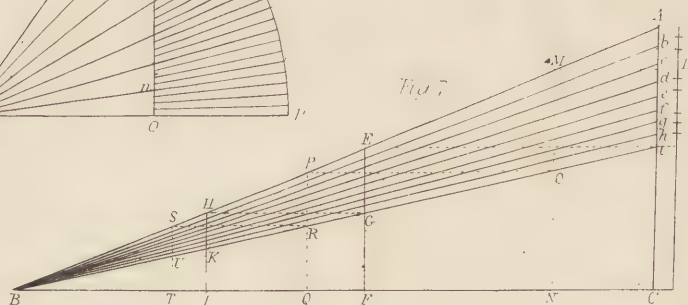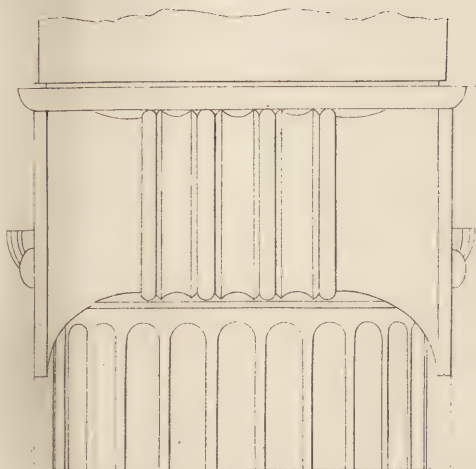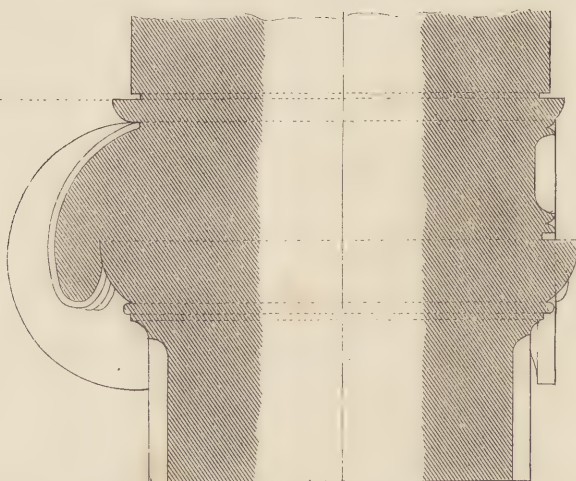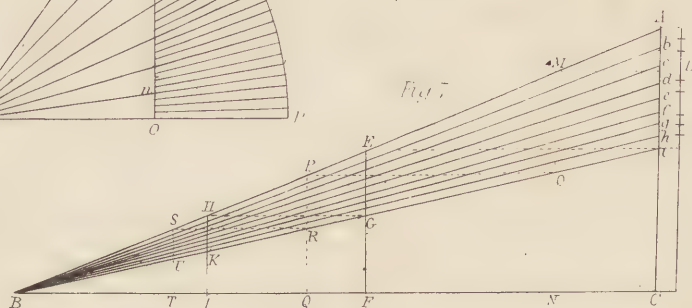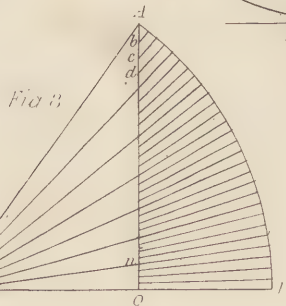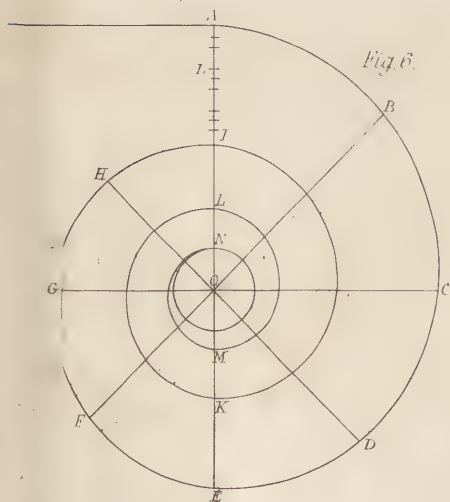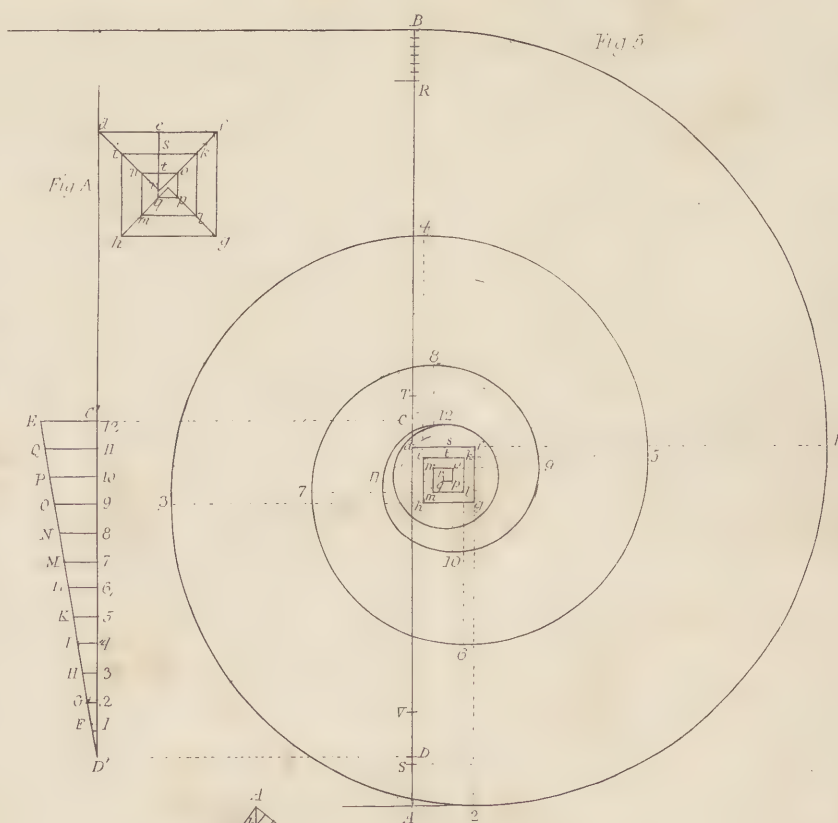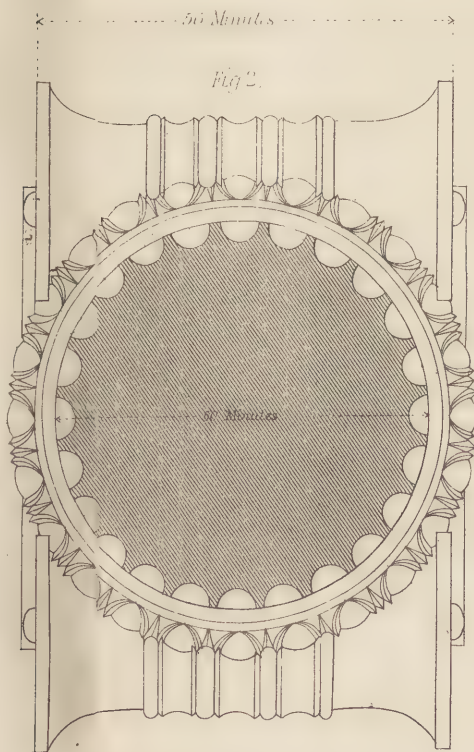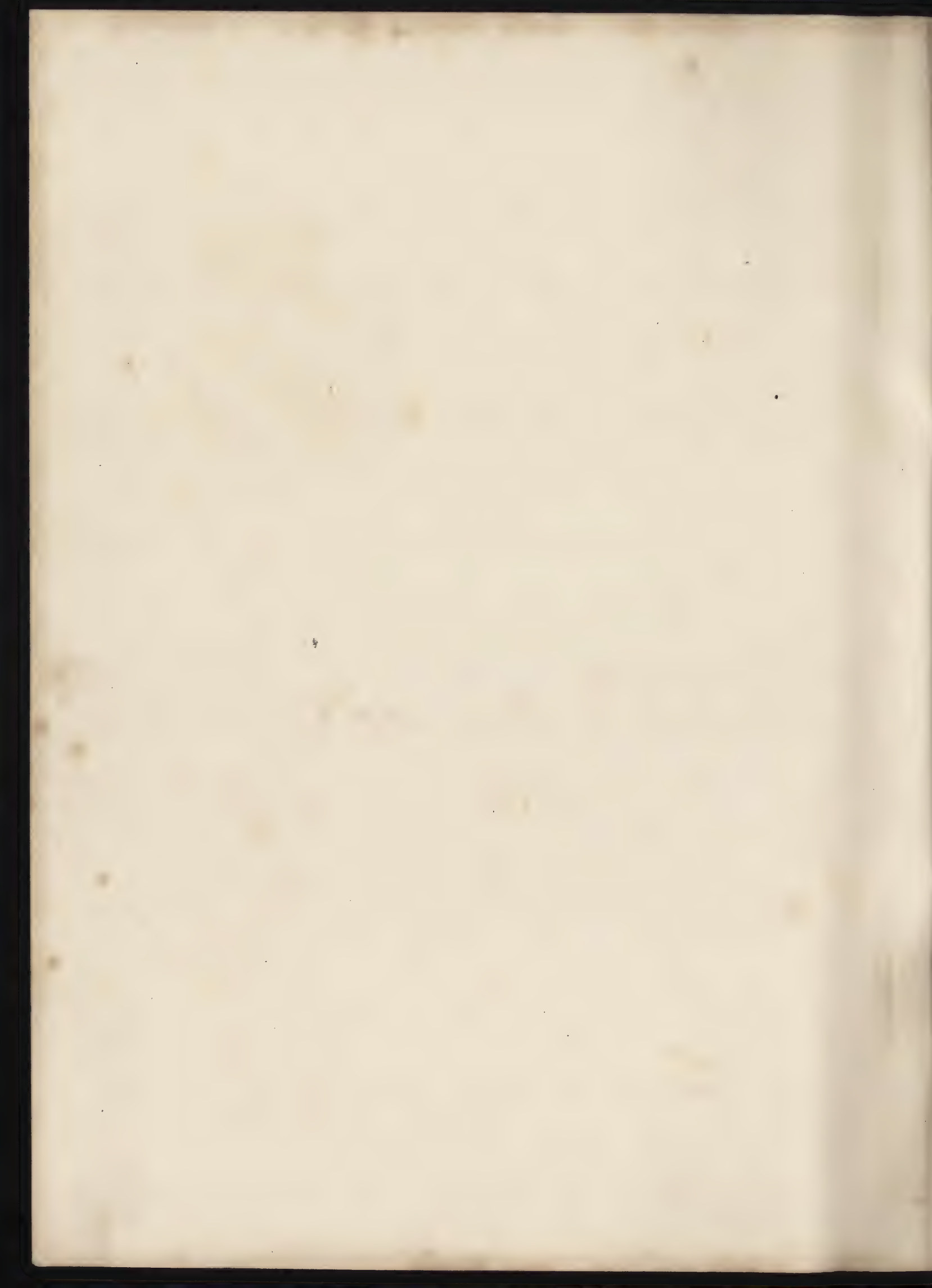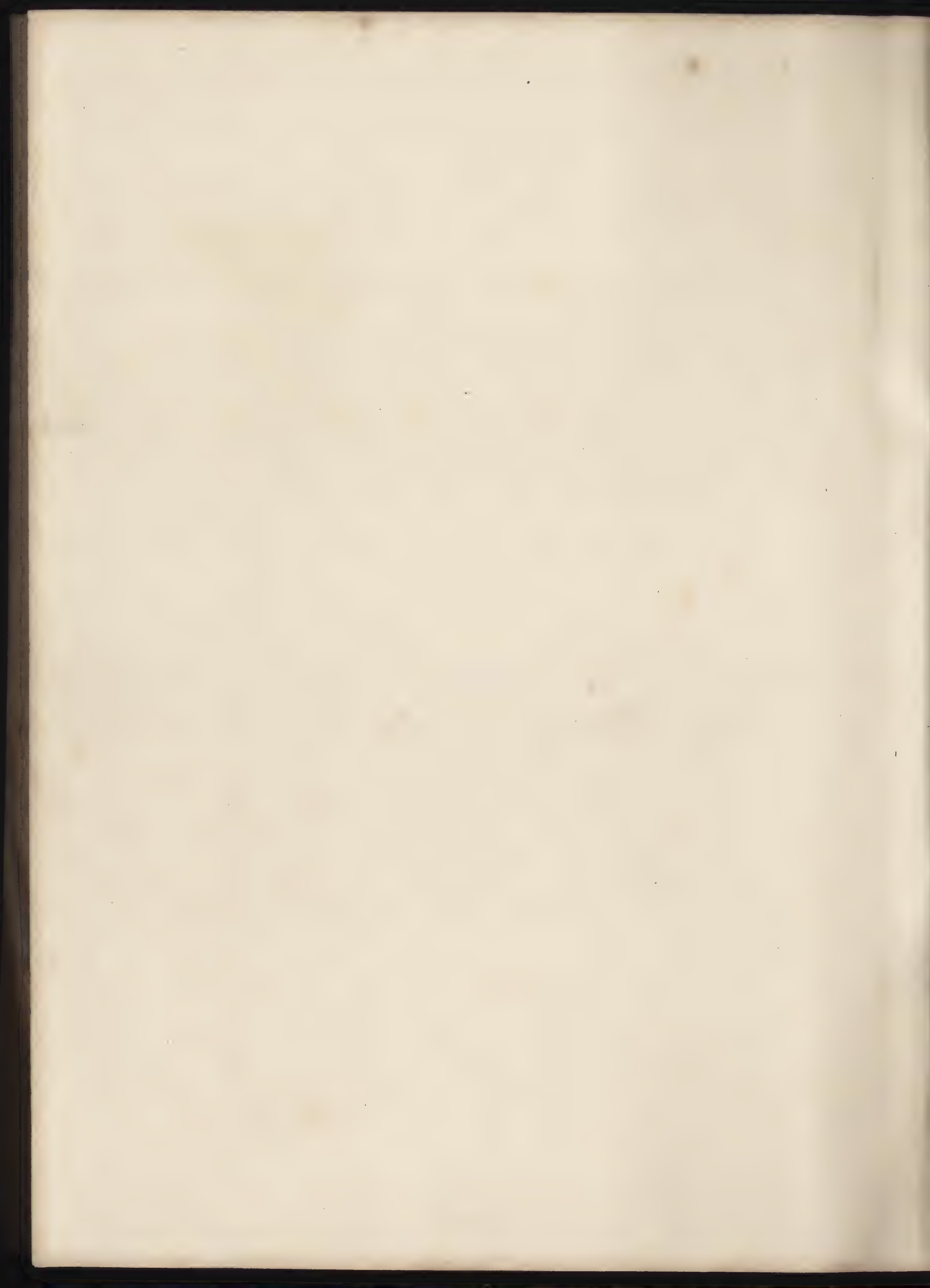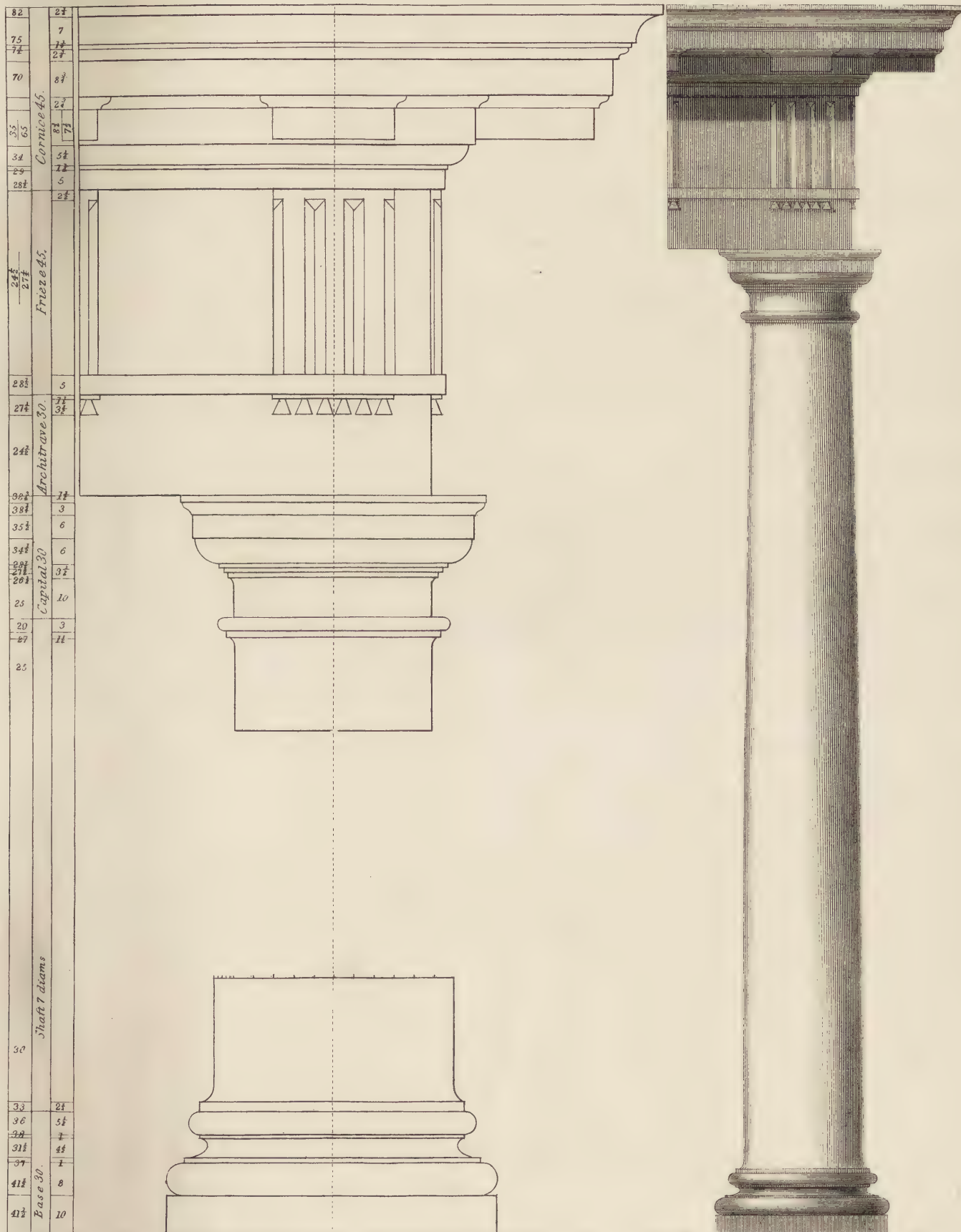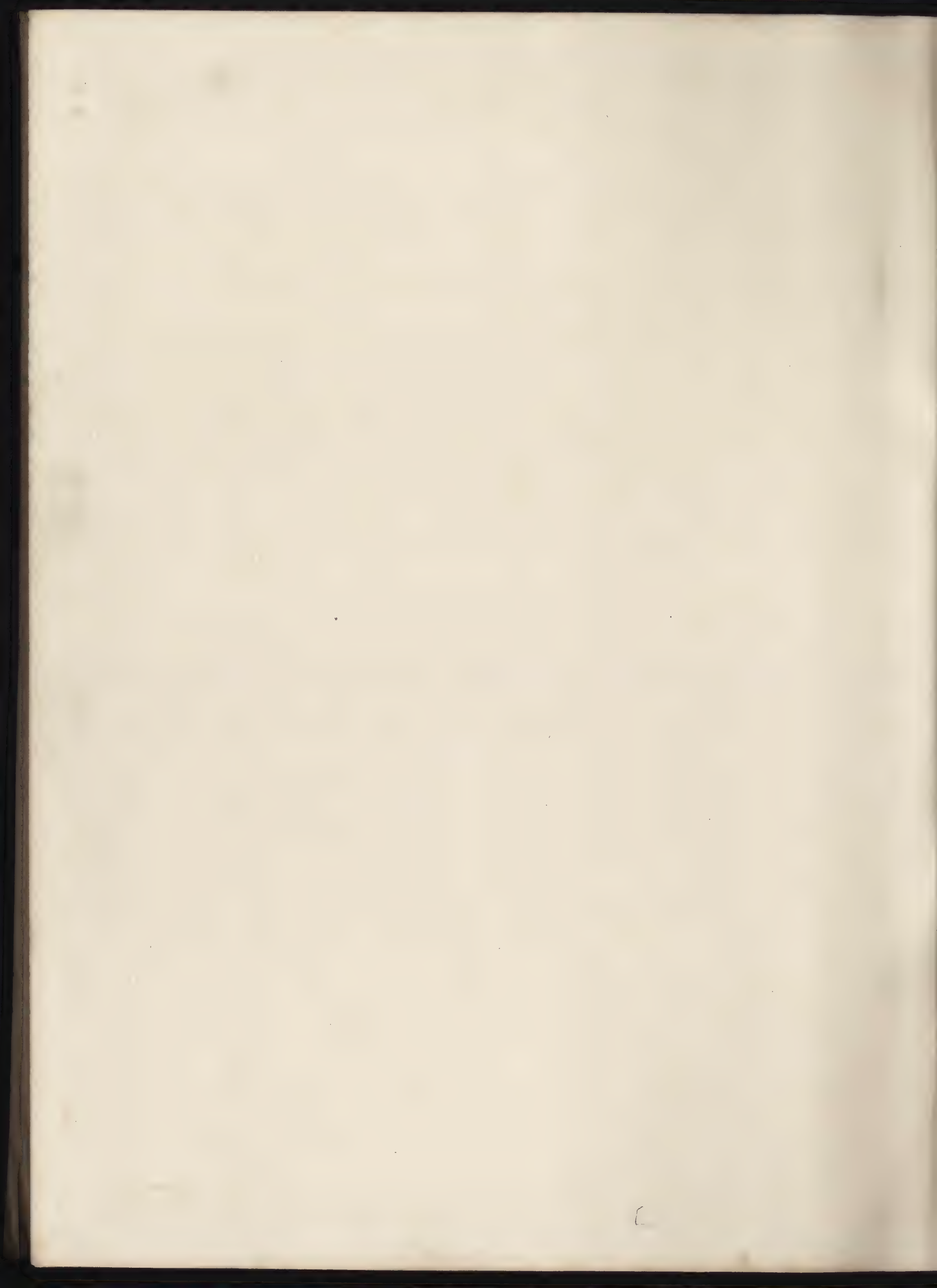
ORDERS of ARCHITECTURE.

ROMAN IONIC ORDER.

Inside of the Capital.

Side of the Capital.

View of the Capital.
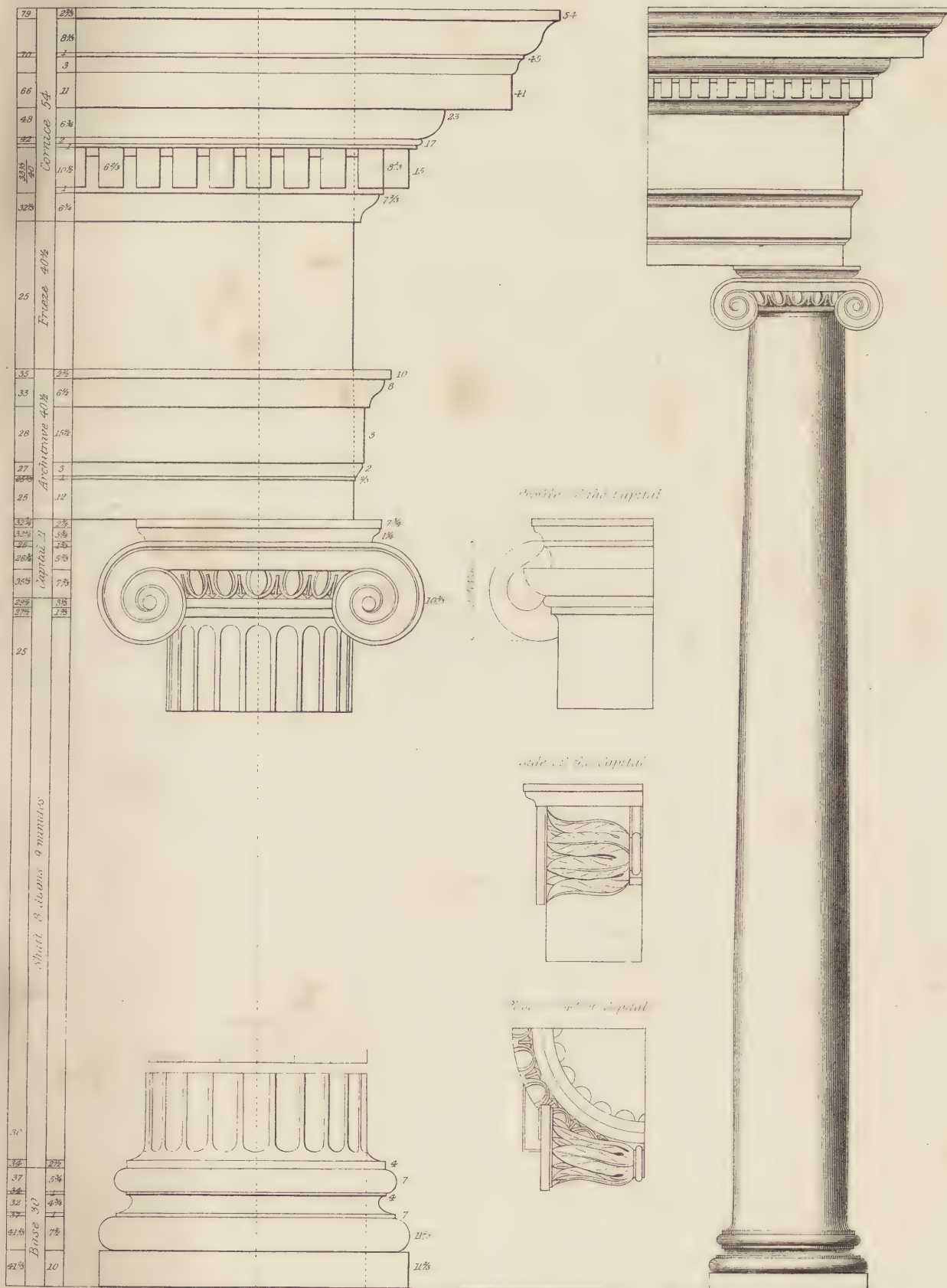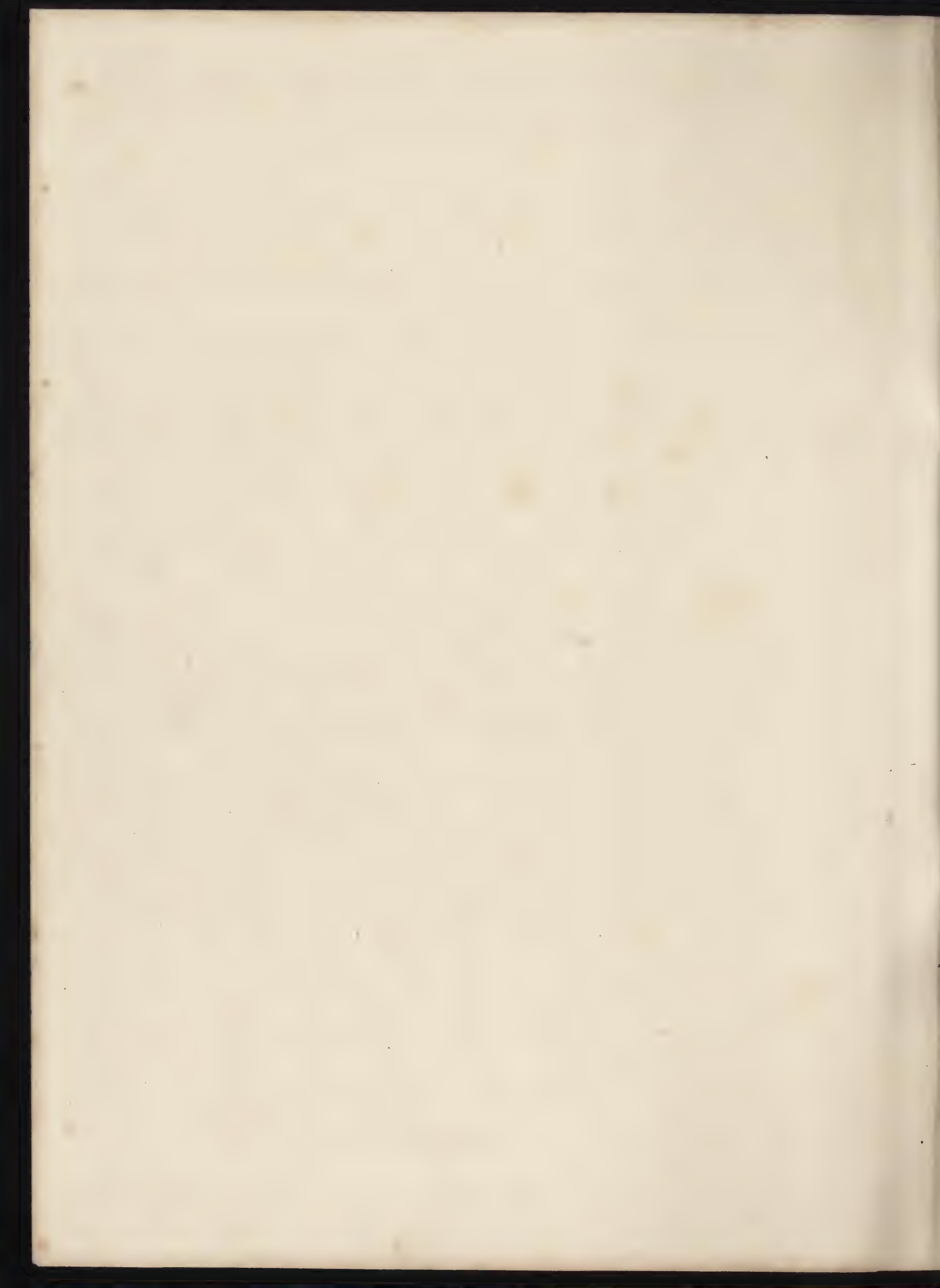
ORDERS OF ARCHITECTURE.

ROMAN CORINTHIAN ORDER.

Plan of the Capital

Angular View of the Capital
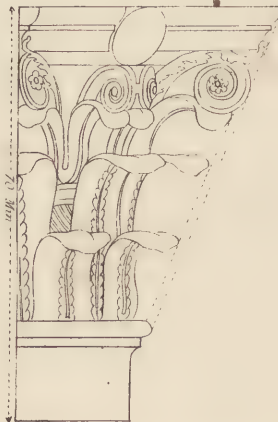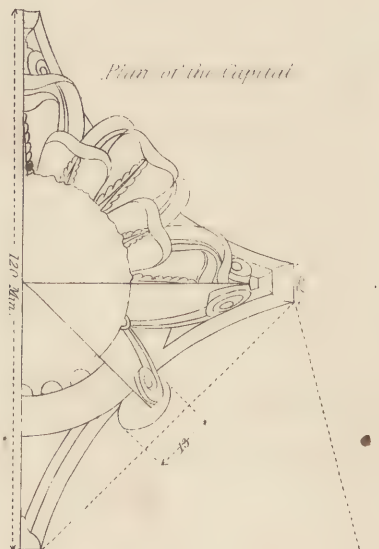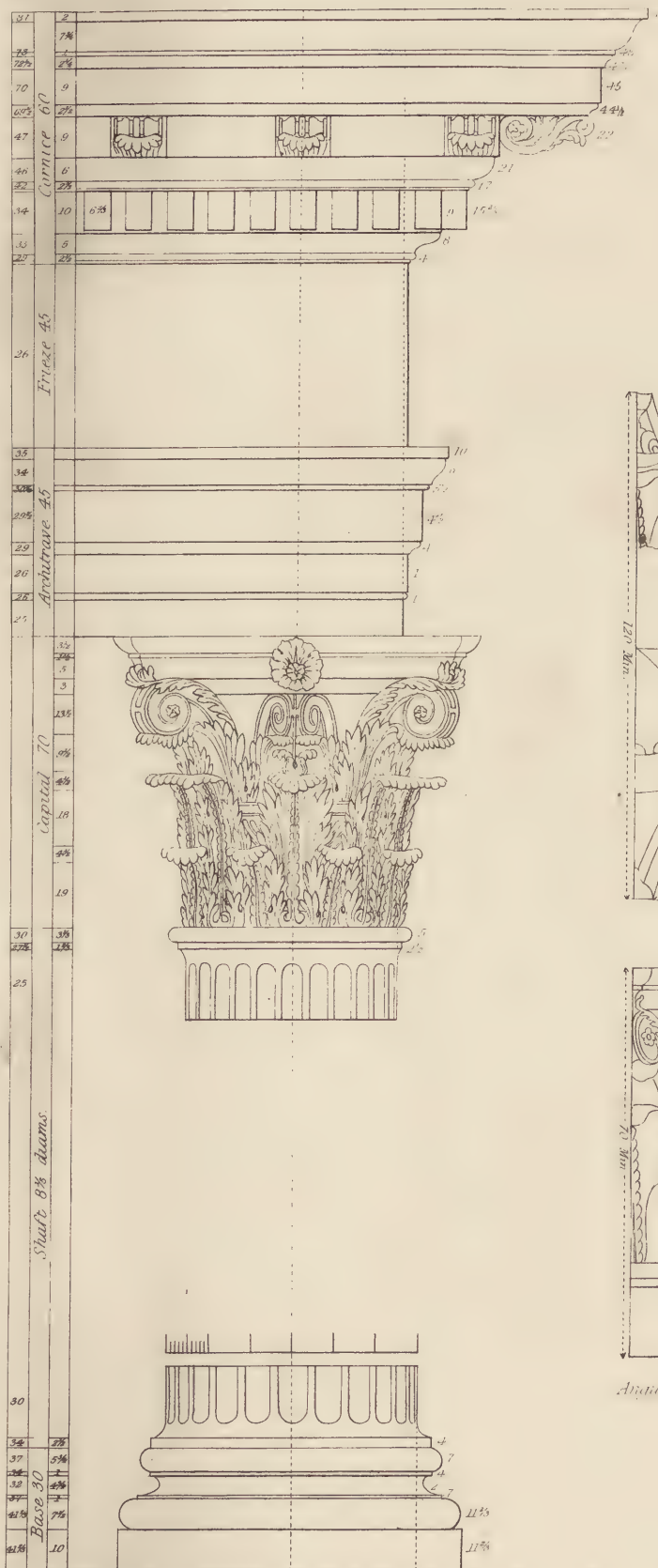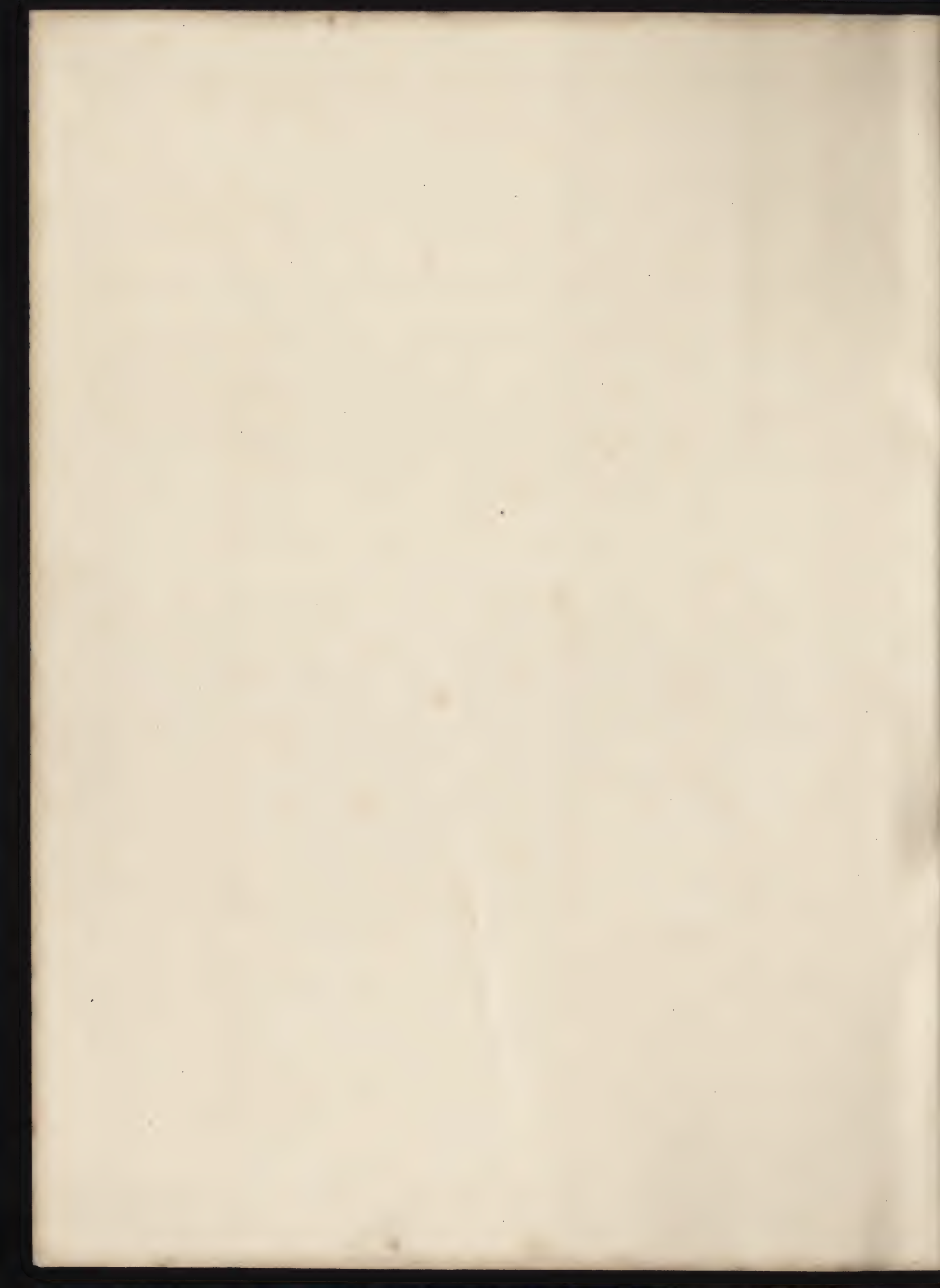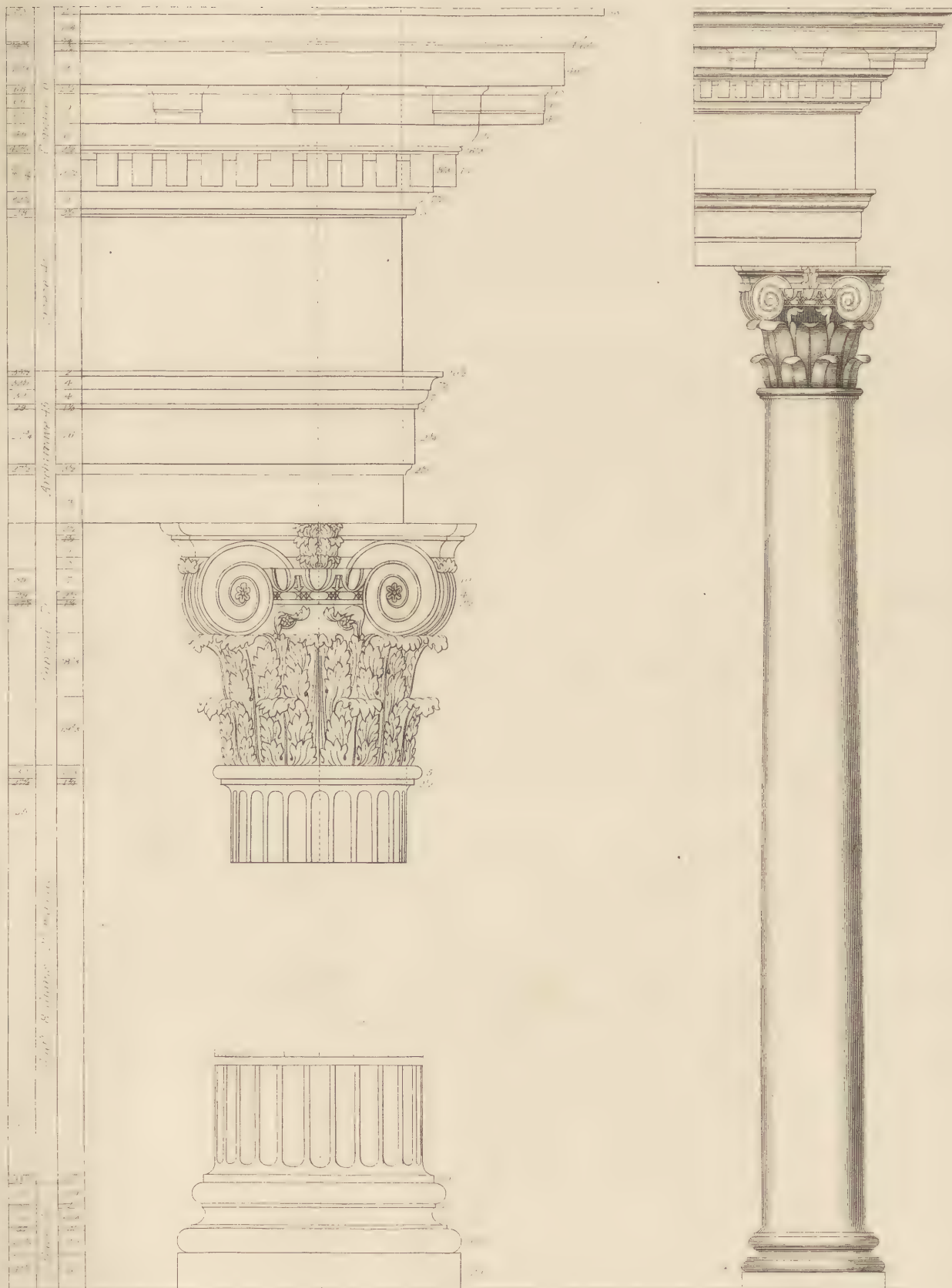
ORDERS OF ARCHITECTURE.

TUSCAN ORDER.
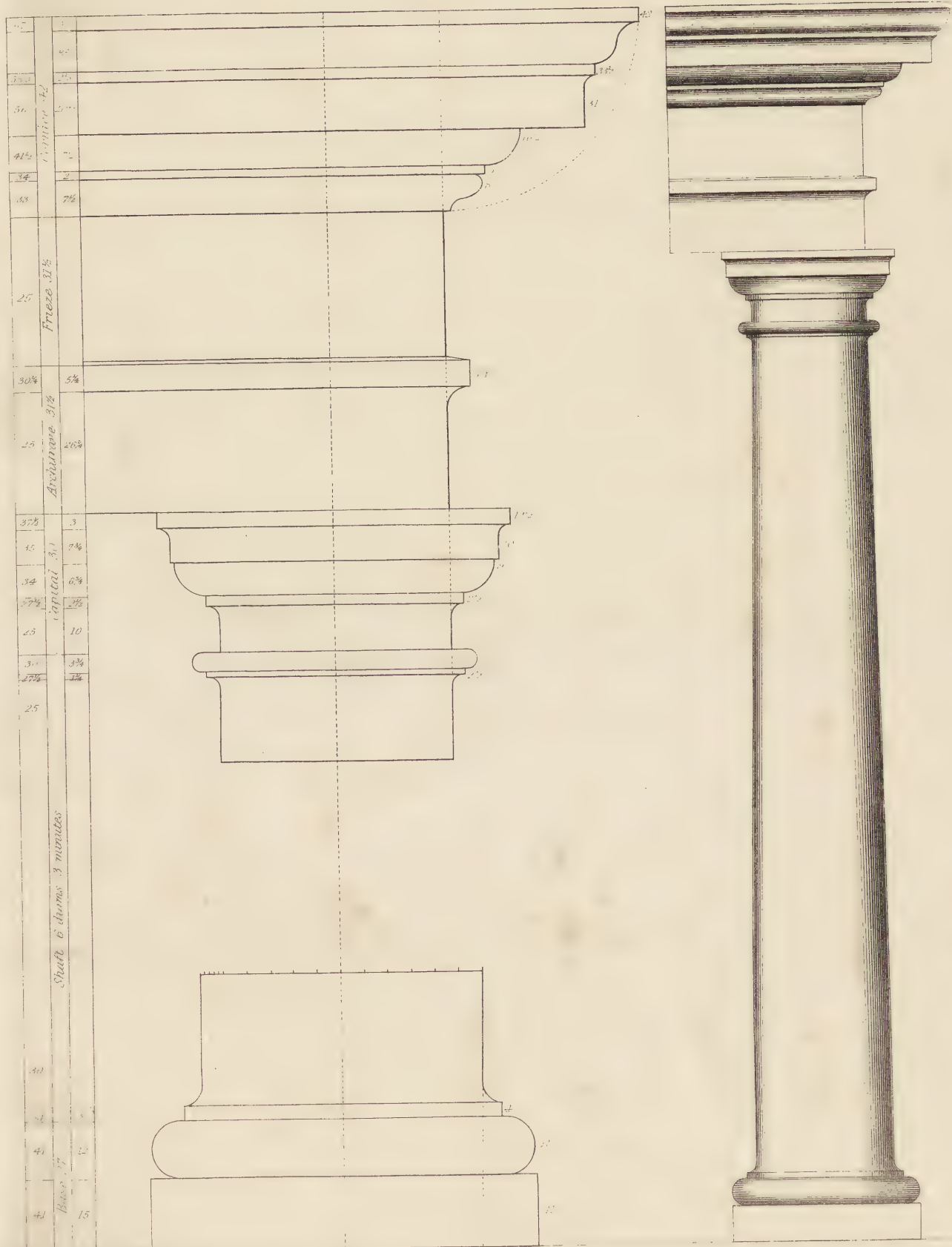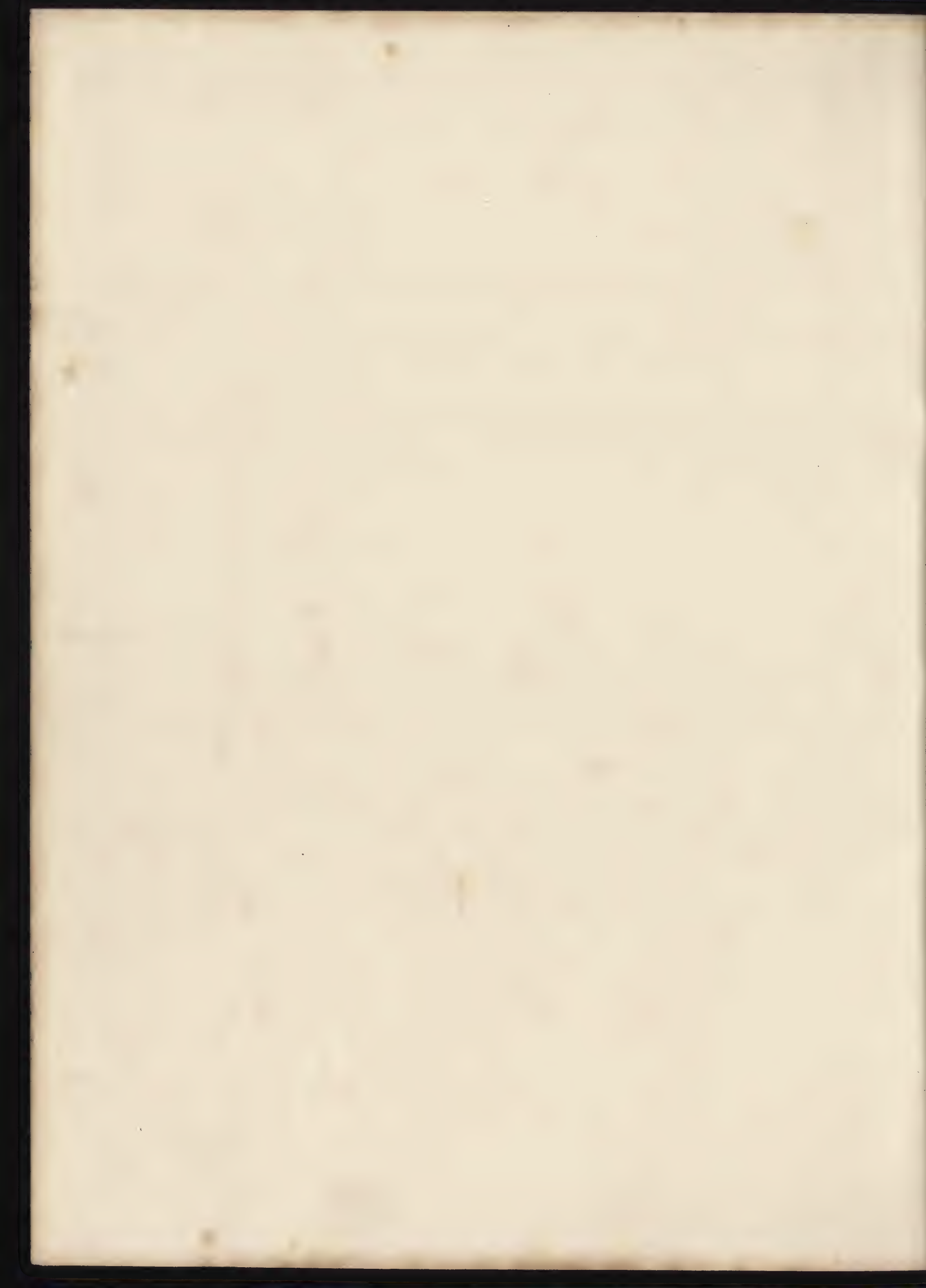
LINEAR PERSPECTIVE.

CHAPTER I.

1. LINEAR PERSPECTIVE may be defined to be the drawing of objects in their exact proportions, with respect to height, length, and breadth, as they appear to the eye when placed in any position. This may be illustrated by placing a pane of glass, or other transparent substance, betwixt the eye and an object, and by keeping the eye steady, and tracing the different lines upon the object; if these lines be distinctly marked on the transparent plane, there would be a *linear perspective* view of the object.

2. It is necessary for the person commencing to learn perspective—if he has not got a previous knowledge of mechanical drawing—to understand the use of the instruments commonly used. We will here, in the first place, explain some of these, and show the manner of using them.

The *drawing-board* is generally made of deal, of a size according to the intended use. We would here recommend one for drawing perspective of about two feet nine inches, or three feet long, by two feet or two feet four inches broad, made of 1 inch or $1\frac{1}{4}$ inch stuff, neatly planed and clamped at the edges to keep it from warping. The paper might be fastened upon it, either by drawing-board pins, which is a very good and the most expeditious method, or by sealing wax, or by paste, which is done in the following manner:—Having cut the paper to the size required, wet the back of it with a sponge dipped in clean water, passing it over several times, and leaving it a short time till the water is absorbed, and the paper lies flat; run a rim of paste round the edge, about three-quarters of an inch wide; then turn the wetted side of the paper downward on the drawing-board, and press the pasted rim close to the board with a paper knife, or some hard substance, pressing as much of the paste out as possible, that the paper may adhere firmly to the board. The face of the paper should be then wetted in the centre with a sponge, taking care not to pass it on the pasted rim: without this precaution, the centre would be dry before the edges, and the paste would not hold.

A

The best sort of drawing-boards are those made in a panel form: in these, there is an outside frame rebated on the inside, into which there is a moveable panel fitted, also rebated, to allow of the panel coming nearly flush with the upper surface of the frame. The paper is placed upon this panel, and then put into its place, where it is fastened by two pieces of wood in the back. This is undoubtedly the best sort of drawing-board, as it keeps the paper stretched, and answers well for drawings which have a deal of minute work about them, and also for colouring.

The next instrument is the T *square*, which is so well known that we would just recommend it to be made straight and strong, not to bend when drawing near its end; those made with a screw, for drawing lines at any inclination, are most preferred. There are also small pieces of mahogany of a right-angled triangular form, called *set squares*, which by moving along the edge of the T square, lines can be drawn at angles for which the squares are made—those with 45° and 60° are very useful.

Compasses are very useful instruments in mechanical drawing. They should be fine pointed, and move freely at the joint, which should not, however, be too slack, for then a little compression might move them from their position. Those with fixed legs are called dividers. When the moveable leg is taken out, there is a leg which can be put into its place, having a piece of lead pencil fastened into it, for drawing circular lines in lead, and also another for circular ink lines.

Drawing-pens are very useful instruments for drawing lines in ink, after being marked out with lead. The handle is made mostly of brass or ivory, having two steel prongs on the one end, which can be brought close, or widened (betwixt which the ink is placed), by means of a screw, for drawing the lines fine or broad. There are also *bow-pens*, for drawing small circles in ink, which are very useful, and similar ones for drawing lead lines.

Parallel rulers are for drawing parallel lines: they are generally made of two pieces of wood, connected by two pieces of brass, fastened to them near the ends, allowing the wood to move freely: by holding on or pressing upon it, the other can be moved, and it is still held in its parallel position by the pieces of brass. Parallel rules moving on rollers are to be preferred.

These instruments, with scales, and a few others occasionally used, are those employed in mechanical drawing; those used in perspective will be described farther on. It may be remarked, that there are cases or boxes of instruments, containing compasses, drawing-pens, scales, &c., of different prices, from a few shillings to a number of guineas, to be got in almost every town of note in the three kingdoms—the student, by seeing them applied, will learn their use far better than by a written description.

3. It is presumed that the student is acquainted with practical geometry—raising

perpendiculars, describing squares, triangles, circles, ellipses, pentagons, hexagons, &c.; if not, we would recommend him to learn that in Bonnycastle's Mensuration, or some other work, as there are many, and it would therefore be useless to enter upon the subject here.

4. There are five ways in which mechanical drawings are generally done:—1st, The *ichnographic* or *ground plan* of an object is the seat of the different parts, showing their correspondence, situation, and magnitude, without any reference to the height. 2nd, The *orthography* or *elevation*, which is the appearance any object would present if an eye could view every part perpendicularly. 3rd, *Sections*—these are cuts made through the object, showing its internal arrangements. If the section be parallel to the front, it is called a *longitudinal section*, and if from front to rear, a *transverse* or *lateral section;* any other is called an *oblique section.* 4th, The *scenographic*—that is, the representation of objects as they appear to the eye when in any position—or the *perspective view.* The scenographic is better applied to the perspectives of objects, as houses, for instance, when scenery is introduced. 5th, The *development*—this is the representation of any circular, elliptical, or polygonal figure, &c., when taken and spread out upon a plane, thereby giving the appearance of an orthographic projection or elevation. Having gone thus far, we will begin now and explain some of the fundamental parts of the science.

5. If a person stand at the middle of one end of a long road, which is supposed horizontal, straight, and of a uniform breadth, the sides will seem to approach nearer and nearer to each other as they are farther from his eye; and if the road be very long, the sides of it at the farthest end will seem to meet, and there an object that would cover the whole breadth of the road, and be of a height equal to that breadth, would appear to be a mere point. If A B and C D, fig. 1, be two parallel sides of a road, and O the place of the observer—suppose the road to be divided into squares, A C *i e*, *e i k f*, &c., the
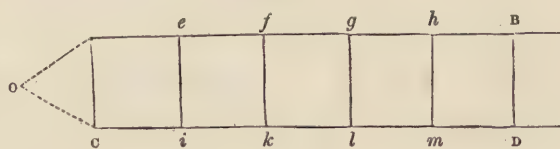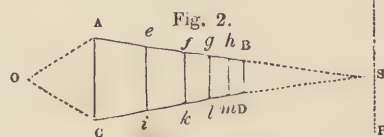
Fig. 1.

Fig. 2.

person standing at O will see these two sides as if they were gradually approaching towards one another, as in fig. 2; and the squares will seem to diminish in size as they are farther from the eye—so that the first square, A C *i e*, fig. 1, will appear as A C *i e*, fig. 2; the second square, *e i k f*, fig. 1, will appear as *e i k f*, fig. 2; and so on till the last square, which would vanish into a point, as S in fig. 2, where A S and C S meet.

6. The point, S, where the parallel sides of the road seem to meet, is called the *point of sight*, and is still opposite to the observer, and at the height of the eye. The place where the observer's eye is placed is called the *place of the observer*, or the *point of view.* The line, P S. passing through the point of sight, is called the *horizon.*

CHAPTER II.

1. In the annexed figure it is intended to show more particularly the principles upon which this kind of perspective depends.   G I K L is called the *ground plane*, upon which there is a square, P R S Q, to be drawn in perspective; F A B C is the *plane of the picture*, upon which the representation is to be made; E is the *point of view*, sometimes called the *point of sight;* it is the place of the observer's eye, and hereafter shall be called the *point of view*, and the *point of sight* shall be applied to the point opposite the eye in the horizon, to which lines and planes perpendicular to the plane of the picture converge.   M N is the horizon of the picture, or the representation of the meeting of the sky and water, if an observer were looking at the ocean; and it may be remarked that the
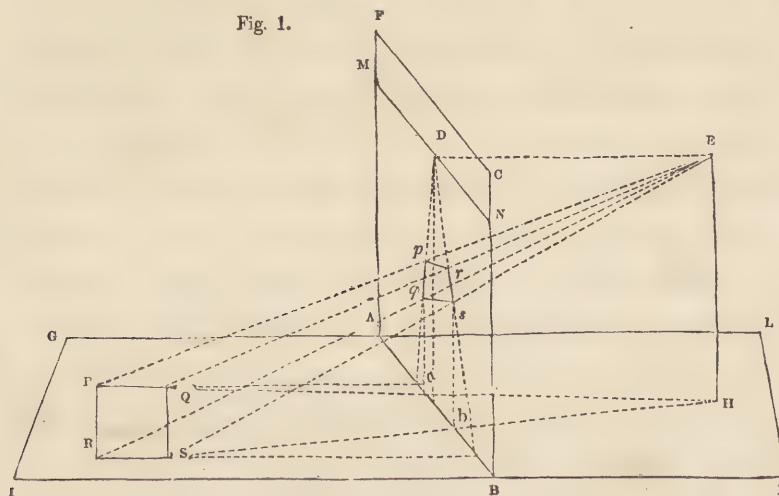
Fig. 1.

horizon, M N, is still on a level with the eye.   If a sketch were made on the top of a mountain, the horizon would then be high up; and if made from a valley or some low place, the horizon would then be low down: and in every linear perspective drawing, there must be a *horizon* or *horizontal line.*   We might suppose M N was the representation of the line or visible connection of sky and land; and this apparent meeting or line, though below the level of the eye, is still put at the eye's height, as the distance from the eye to the picture is so small, that there can be no sensible difference in taking the horizontal line, M N, at the height of the eye.

E D is perpendicular to the horizon, M N; the point, D, is called the *point of sight;* the line, A B, in which the plane of the picture and the ground plane intersect, is called the *section line:* now, if lines be drawn from P Q R S to E, the points, *p q r s*, where these lines intersect the plane of the picture, being joined, will form the perspective representation of the square.   The operation just mentioned may be said to be of no very great use in drawing perspective, as a transparent plane cannot always be held before an object, for perspectives are made of houses, bridges, machinery, &c., before any of them are built or constructed; indeed, if perspective consisted only in this, it were very contracted, and therefore of no great importance.   We see, therefore, recourse must

be had to other means. The point, H, in the ground plane, directly under the eye, is the point to which the lines are drawn from the object; we have drawn two in the diagram, as more would only have caused confusion: and from the points, *a b*, where they meet the section line, we raise perpendiculars until they meet lines drawn to the point of sight in *q s*, from the points where P Q and R S meet the section line produced. If two other lines had been drawn from P R to H, and perpendiculars raised as before, they would have marked out *p r*; if then, *p r, q s*, &c., be joined, there would be formed
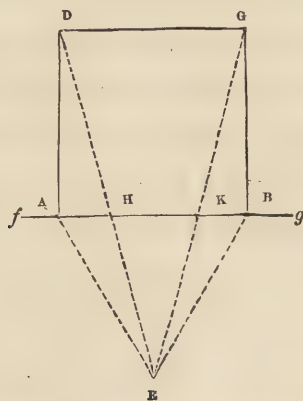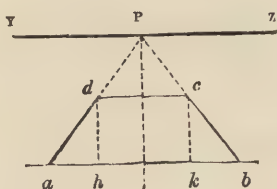
Fig. 2.   Fig. 3.   Fig. 4.
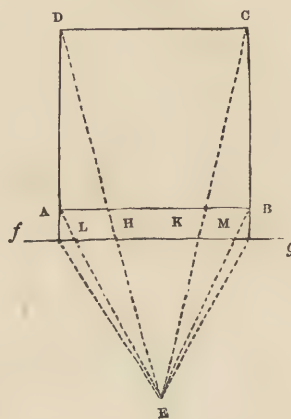
p q r s, the perspective representation. This will be better understood by the following, with respect to the square.

2. *To put a square in perspective.* Let A B C D be the square which is to be drawn, and E the point of view. We will suppose, in the first case, that the plane of the picture, or the section line, *f g*, coincides with the side, A B, of the square, and that the point of view is exactly opposite the side, A B, of the square, the visual rays, E D, E C, are drawn, making the side, D C, appear equal to H K. The side of the square is eight feet, and is laid down at the scale of an eighth of an inch to the foot. In fig. 3, *a b* is made equal to A B, fig. 2, because it touches the section line or plane of the picture, and therefore it is the real size. Draw the horizontal line, Y Z, at the height of the eye, about five feet four inches, and as the observer

Fig. 5.

stands opposite the middle of the side, *a b*, the point of sight, P, will be also opposite the middle; join P *a*, P *b*, make *h k* equal to H K, and put half on each side of the central line, and draw the perpendicular *h d, k c*, and join *c d*—then *a b c d* will be the perspective representation.
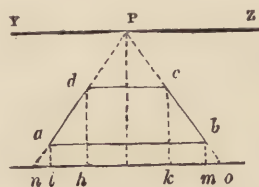
3. In the second case, we will suppose that the plane of the picture does not touch the side of the square, but the observer is still standing opposite the middle of the side, as in fig. 4.

Draw the visual rays, E A, E D, E C, E B; then the apparent sizes of D C and A B will

B

be H K, L M; then, in fig. 5, draw the base line *n o*, and at the proper height the horizontal line Y Z; leave off *h k, l m, n o*, respectively equal to H K, L M, A B, one half on each side of the central line; join *n* P, *o* P, and draw the perpendiculars, *l a, h d, k c, m b*, and join *a b, c d*; then *a b c d* will be the square.

4. In the third case, we will suppose the observer stands to one side, and that the plane of the picture does not coincide with the side of the square, the plane of the picture being still parallel to the side of the square, as in fig. 6.

Fig. 6.
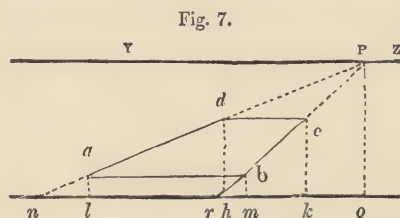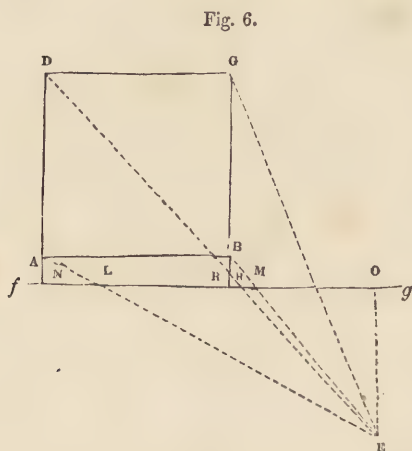
Fig. 7.

Let the visual rays be drawn as before, and let E O be the principal one, or the one directed to the point of sight. In fig. 7, let *n o* be the base, and Y Z the horizontal line, P the point of sight, *o* P the principal visual ray; leave off *o n, o l, o r*, &c., equal to O N, O L, O R, &c.; join *n* P, raise the perpendiculars, *l a, h d*, &c., and join *a b, c d*; then *a b c d* is the square. Now, the attentive reader will easily see the connection of this method with that mentioned in description of fig. 1. The point, E, in figs. 2, 4, and 6, is the same as H, fig. 1, which is the point perpendicularly under the eye on the ground plane. The lines, though drawn from the object to it, mark out on the section line the apparent length and breadth virtually the same as if they were drawn to the point of view. Again, in fig. 1, from the points where the visual rays cut the section line, perpendiculars were raised, meeting lines passing to the point of sight; the same is adopted in figs. 3, 5, and 7, where the perpendiculars are also raised, meeting lines passing to the same point.
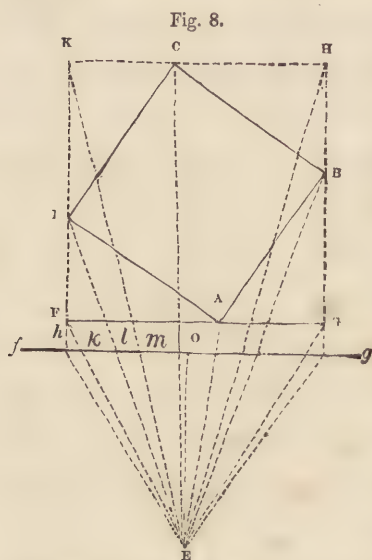
Fig. 8.

In the three examples which we have given with respect to the square, and in other subsequent examples, we might have done with one figure, but we would like to impress these first principles upon the mind of the reader in as easy a manner as possible; we have therefore adopted two figures, that it may be the better understood. It is evident, that if A B C D, in figs. 2, 4, and 6, had been a right-angled parallellogram or rectangle, its perspective could have been as easily made; and if A B, in fig. 6, had touched the section line, it would have been easier.

We might also mention, that if A B C D had been a pavement divided into squares, or if it were a square garden, or a rectangular one with straight walks and flower

plots, it could be very easily drawn by going upon the same principle which we have adopted.

5. There is still another case with respect to the square, viz. :—when the section line is oblique to all of the sides, as in fig. 8.

Draw F G parallel to the section line, as also K H, and draw the perpendiculars, K F, H G; draw the visual rays, E F, E D, &c., and E O, the principal one.

Now, let the base line and also the horizontal one be drawn, fig. 9, as before, and also *f' g' h' k'*, the perspective representation of F G H K, and let *o* P correspond with E O, the principal visual ray; leave *o h'*, *o k'*, &c., equal to *o h*, *o k*, &c., and let the perpendiculars be raised till they meet the lines passing to the point of sight, &c., marking out the points, *f'*, *k'*, &c., corresponding with those in fig. 8, as also *a b c d*, which points being joined, mark out the perspective representation.

Fig. 9.

We have drawn all the lines necessary on the figures, so that the student will clearly see the method of proceeding.
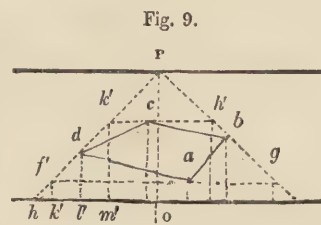
CHAPTER III.

1. It will be seen, by reference to the preceding chapter, that in the three cases of the square which were taken into consideration, in which the plane of the picture was parallel to two of its sides, these sides were parallel to one another in the representation, and the other two sides converged to the point of sight; but (in 5) where the sides were oblique to the plane of the picture, it was seen, that in the representation, the two sides, which in the former cases were parallel, are no longer so, but converge to a point on the horizontal line, whilst the other two converge to another point also on the horizontal line. This will take place if they be accurately constructed; whereas, those lines which circumscribe the square converge to the point of sight, or are parallel to one another, as the case may be. These points to which the lines converge are called *vanishing points*, and are in general on the horizon.

2. Linear perspective is of two kinds. The first is called *direct* or *parallel;* it is the same as described in Chap. II. This is the easier sort; it is so called, because, in the face of the object (which is parallel to the plane of the picture) in the repre-

sentation, the horizontal lines are parallel, whilst on the end or flank these lines converge to the point of sight. The second kind is called *indirect*, because those lines which, in the former case, were parallel to one another and to the horizon, in this are not, but converge to the vanishing point; and also those on the end or flank, which in the former case converged to the point of sight, in this they converge to a vanishing point.

As the two kinds are differently managed, and the *direct* being the easier, we shall consider it first:—

Fig. 1.

3. By proceeding nearly in the same manner as that adopted (in 5), we could, by direct perspective, put the plan of any object into this sort of it when the figure is bounded by right lines; and, as will subsequently be seen, the plan of any figure, no matter by what sort of lines bounded. Now, that we may be perfectly understood in this, we will put first a triangle, and then any rectilineal figure, by this method into perspective.

4. To put a triangle into perspective by the direct method.

Let A B C, fig. 1, be the triangle, *d f* the section line, E the point of view. Draw the visual rays, E A, E C, E B, cutting the section line in *a c b*; draw also the perpendiculars, A *d*, B *f*, C *e*, and the principal visual ray, E *g*.

In fig. 2, draw the base line, *d f*, at the proper height, also the horizontal line, Y Z. Let *g* P represent the principal visual ray, proceeding to the point of sight, P; leave off *g d*, *g a*, &c., equal to *g d*, *g a*, &c. Draw lines to the point of sight, P, from *d, e, f*, and raise perpendiculars from *a, b, c*, to meet these lines respectively, and they will mark out the points, A, B, C, which being joined give the required representation.
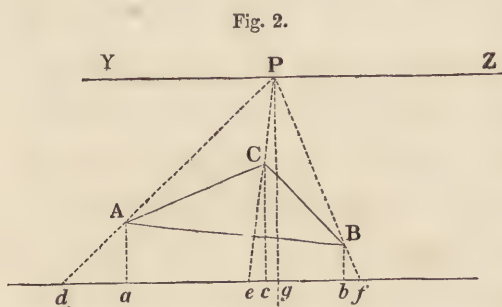
Fig. 2.

5. To put any rectilineal figure into perspective by the direct method.

Since any rectilineal figure is composed of triangles connected with one another, it follows that the figure can be easily put into perspective when the method of putting the triangle is known.

Let A B C D F, fig. 3, be the rectilineal figure, *e n* the section line, E the point of view; draw the visual rays, E A, E F, &c., and the perpendiculars, A *e*, F *g*, &c.

Then, in fig. 4, draw the base line, *e n*, the horizontal line, Y Z, and take the point of sight, P, and let P *h* be the principal visual ray. Leave off *h e*, *h a*, &c.,

respectively, equal to *h e*, *h a*, in fig. 3, and draw the lines *e* P, *g* P, *k* P, *m* P, *n* P, to the point of sight, and from the points *a, f,* &c., draw perpendiculars until they respectively meet the other lines in the points A, F, &c.; these points being joined will give the representation.

6. Having now shown the method of putting the plan of any object, when bounded by right lines, into this perspective, before proceeding to the consideration of objects with regard to height, we would recommend the reader who may read this, and who would wish to become acquainted with this useful branch of science, to make all the figures two or three times the size here shown, and afterwards progressively introduce others which the fancy may dictate—such as quadrilaterals, pentagons, hexagons, &c.—as a short practice will sooner and more efficiently bring it home to the mind than any descriptions, no matter how well and how easily written.
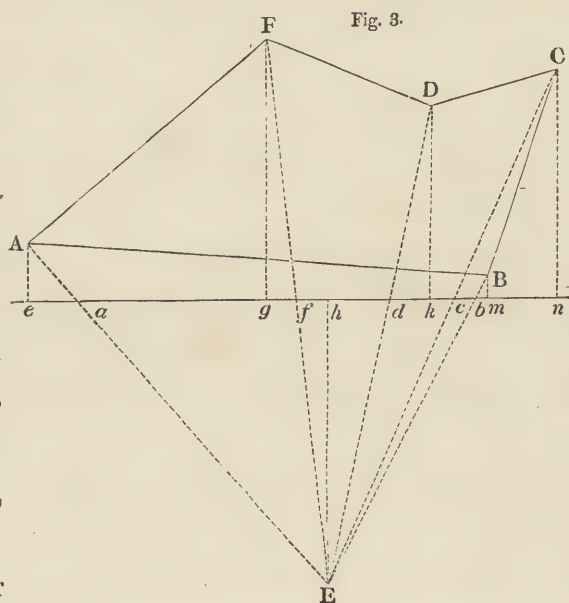
We are well aware, from a very particular examination of the principles of direct perspective contained in various works, such as Ferguson's, Hayter's, and a voluminous work by a French Jesuit, translated by Chambers, &c., &c., that the way we treat it is different from theirs a little; yet ours is conducted in the same manner as that adopted in indirect perspective—with this difference, that in the latter there are vanishing points to which the lines converge, whereas it is to the point of sight they converge in the former, as described by writers on this branch; and it is our opinion, that it is founded upon rational principles, and deducible from mathematical precedents, and easy in its application.

7. With respect to the distance the observer should stand from the object, some lay it down as a rule to stand off the distance of the two visible sides taken together—as, if the object were a house, to stand off a distance equal to the length of the two sides which are seen; whilst others consider this too little, and we think it answers better to stand farther off than this—say about as much, and one-fourth or one-third as much more. It greatly depends on taste; but there are some positions which give better perspectives than others, as is very soon learned from practice. Others stand off such a distance as that the angle

C
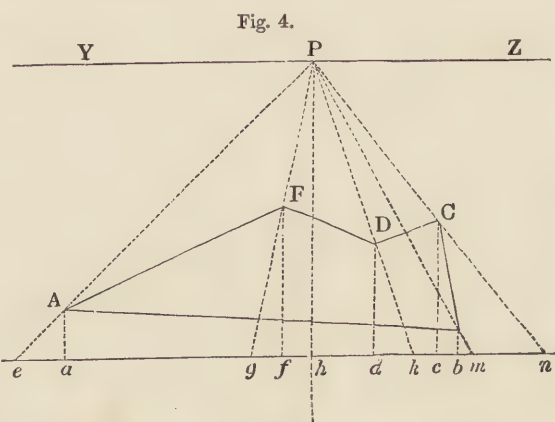
comprehended between the extreme visual rays which proceed to the object may be about 60°, as the angle, A E B, in fig. 2 of Chapter II.

CHAPTER IV.

To put a cube, parallelopiped, or a box in perspective.—Let the dimensions of it be 7 feet long, 4 broad, and 3 high. Make the plan, A B C D, fig. 1; draw the section line, *e g;* take E, the point of view at a distance, equal to A B and B C together, from the object, and draw the visual rays, E A, E B, &c., and produce D A, C B, to *e* and *f.*

In fig. 2, draw the base line, and at the proper height, say about five feet four inches, the horizontal line, Y P; take the point of sight, P, leave off *g e, g a,* &c., equal to *g e, g a,* &c., in fig. 1; draw *e* P, *f* P, to the point of sight, P, and raise the perpendiculars, A *a,* B *b,* C *c,* D *d;* join A B C D, then A B C D is the perspective representation of the rect-angular base.
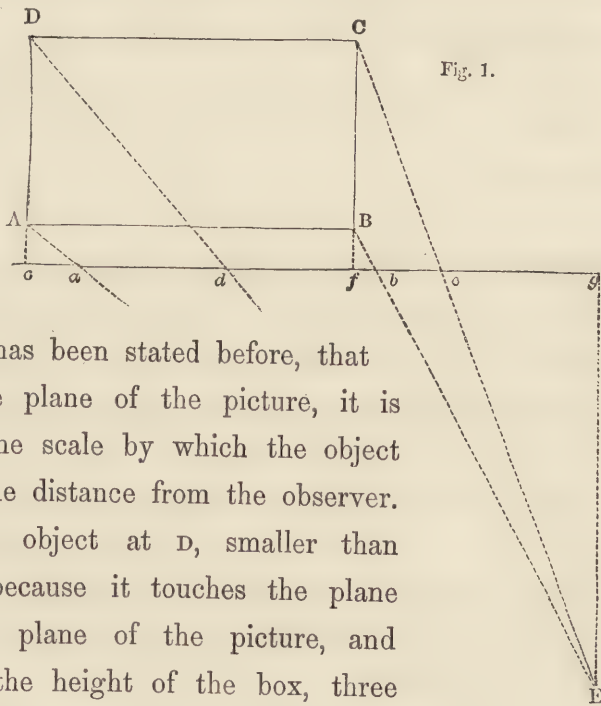
Here we would remark more fully what has been stated before, that whenever any part of an object touches the plane of the picture, it is made the real size—that is, with respect to the scale by which the object is represented—and the smaller, the greater the distance from the observer. Now, a person at E, fig. 1, would see an object at D, smaller than at B; but at *b* it would be the real size, because it touches the plane of the picture. In fig. 2, *e* E is on the plane of the picture, and perpendicular to the base line, *e g;* if then the height of the box, three feet, be left off on *e* E, and a line drawn to the point of sight, P, the point, F, where it cuts the perpendicular, A F, will give A F, the perspective height required, the parallel, F G, and also the line G P, intersecting the perpendicular from C in H, and then draw the parallel, H L; this then will give the required representation.

A perpendicular from *f* would have answered equally as well for the height line. If the object were a cube, its perspective would be found in the same way; and if the object touched the section line, its perspective would be still more easily found.

2. *To put a pyramid in perspective.*—Let it be a triangular one, each side of which is six feet, and the perpendicular height seven.

Let A B C, fig. 3, be the plan of the pyramid, O the centre, take E the point of view, and let the section line be parallel to side, A B, and touch the angle, C; draw the visual rays, and the principal one, E g, and the perpendiculars, A e, O C, B f.

In fig. 4, let P be the point of sight, Y Z the horizontal line, and e g the base line; leave off g e, g a, &c., equal to g e, g a, &c., in fig. 3; and because the lines,

Fig. 2.

Fig. 3.

A e, O C, B f, are perpendicular to the section line in fig. 3, they will converge to the point of sight. Raise the perpendiculars, A a, O o, B b, and they will give the points, O, A, B, the latter two of which being joined with C, gives the perspective of the base. Draw the perpendicular, C G, and leave off the height on it, seven feet, and draw the line, G P, to the point of sight, P: the point H, where it cuts the perpendicular from the centre O, is the vertex of the pyramid, which being joined with A, B, and C, gives the required representation. Only one side of it is seen when the point of view is opposite the middle of that side.

If A B C, fig. 3, were the plane of the base of a frustrum of a pyramid, and the dotted lines a b c its top, its perspective would be found by putting the small triangle in perspective, as in fig. 4, and raising perpendiculars until they would meet the lines from A B and C to H, and then joining these points for the top, the base being previously formed as before.

It is evident from this, that any pyramid, whether triangular, rectangular, octagonal, &c., or any frustrums of these, might in this manner be put in perspective, and also any prism.

Fig. 4.

3. *To put the block of a house in this perspective.*—In fig. 5, let the dotted lines indicate the outline of the walls, and the drawn lines the roof; the section line touches one side of the roof.

In fig. 6, P is the point of sight, Y Z the horizontal line, *a c* the height line, which touches one corner of the roof, *a b* the base line. The roof being the most difficult part, is done in the following manner:—The height, *a g*, to the spouting, is left off on *a c*, and its depth (five or six inches), and then two lines are drawn horizontal
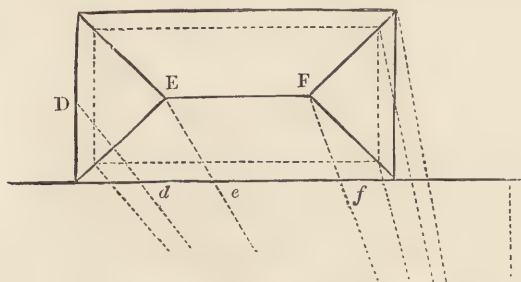
Fig. 5.   Fig. 6.
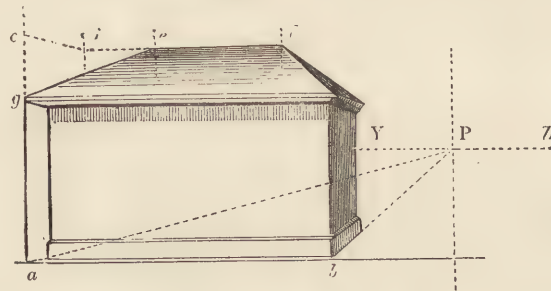
to the other side, and then from its extreme projection, which is found by plan lines, two lines are drawn to the point of sight. Now the height to the under side of the projection of the roof must be perspectively laid off, and it, together with the line of projection, and two short lines (one at *g* to the point of sight, the other at the remote corner horizontal), will show the *soffit* or under side of the projection of roof. For the height, leave off *a c* equal to the whole height, and run a line to the point of sight, cutting a perpendicular in *d*, which corresponds with D in fig. 5, and then a horizontal line, cutting the perpendiculars in *e* and *f*, which points again with E and F, fig. 5, and then draw lines to the extremities of the roof. The plinth may be easily put round the two sides, and the rest of it is easy.

CHAPTER V.

1. The drawing of curves in perspective, or curvilinear perspective, is more complex, and therefore more difficult, than that of right-lined or rectilinear perspective. The ellipse, hyperbola, parabola, &c., are seldom drawn in perspective; if so, the method of points, which are here pointed out for the circle, are equally applicable with respect to them. It is evident, that if the eye be directly over the centre of a circle, or in

a line drawn perpendicular to its plane from the centre, its perspective representation will also be a circle; for, if the plane of the picture be put betwixt the eye and the original circle, and of course parallel to it, and lines drawn from the eye to the circumference of the original, these lines would evidently trace out a circle on the plane of the picture.

Let D E F be a plane on which there is the circle, B G C, and O its centre, and O A the principal visual ray, passing through the eye, A; now, if rays be supposed to pass from every point of the circumference to A, these rays will form a cone, and every plane, parallel to the original, D E F, will be cut by these rays in a circle. If the plane, *d e f*, be parallel to D E F, and which might represent the plane of the picture, it will be cut

Fig. 1.
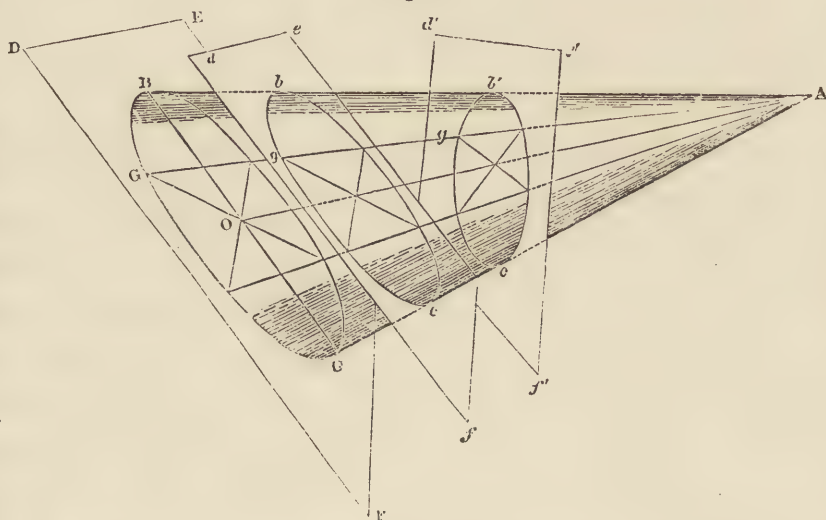
also in a circle, as *b g c;* it will be greater or less than the original, according as it is farther off, or nearer to the eye, than it. In mathematical language, the diameter of this circle is to the original in the ratio of their distances.

Now, suppose another plane, as *d' e' f'*, intersects the cone of rays, but is not parallel to the original, it can be proved mathematically that *b' g c'*, the perspective representation, will be an ellipse: it may be said the perspective of a circle is generally an ellipse.

If the eye of the observer be in the same plane with that of the circle, it will then appear as a straight line. A familiar example of this may be seen in a tea-cup, which, if a person hold in his hand with the eye over the middle of it, will then appear as a circle; and if it be gradually turned round, it will assume the forms of ellipses, becoming more and more

Fig. 2.

elongated until finally it appears as a straight line, or it will assume appearances of ellipses of every possible eccentricity, from zero, or the circle, to one of the diameters, or the straight line.

2. *To put a circle in perspective.*—Let E F G H be a circle; draw two perpendicular diameters, E F, G H, and tangents at their extremities; then A B C D is a square.

If this square be put in perspective by the method previously pointed out, and

D
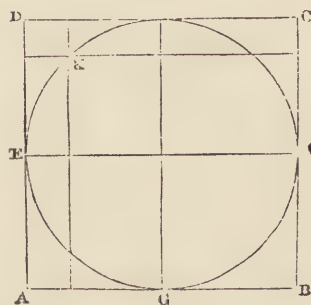
the points, F, G, H, E, found, there would then be four points given, through which the circle must pass. This way will do where great accuracy is not required, but the number of points may be increased. The point, K, may be taken in the curve, and through it parallels to the side; the perspective of K may then be found, and also in the same way any number of points as may be thought necessary, and then the circle traced out with the hand.
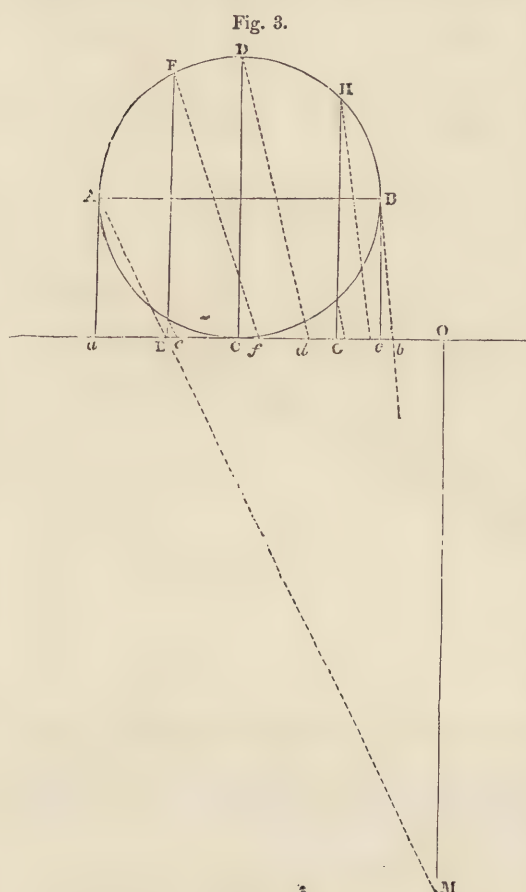
The following way finds eight points which perhaps might be accurate enough for general use.

Fig. 3.

Let A C B D be a circle, say four feet in diameter, and M the point from which it is viewed; draw the two diameters, A B, C D, perpendicular to one another, and such that C D is perpendicular to the section line, O E, which in this case touches the circle. Draw any two lines, E F, G H, parallel to C D, and cutting the circle; and draw lines from the various points to the point of view. In fig. 4, draw the line O E, and parallel to it Y Z, the horizontal line, and take into it P, the point of sight; leave off O E, O C, &c., O e, O d, &c., equal to O E, O C, &c., and O e, O d, in fig. 3.

Because E F, C D, are perpendicular to the section line in fig. 3, in fig. 4 they will run to the point of sight, P, and then perpendiculars from e d, &c., will meet these lines in points e' d', &c., which mark out points in the circumference; and with a steady hand the perspective of the circle may be traced out after the rest of the points have been found in the same manner.
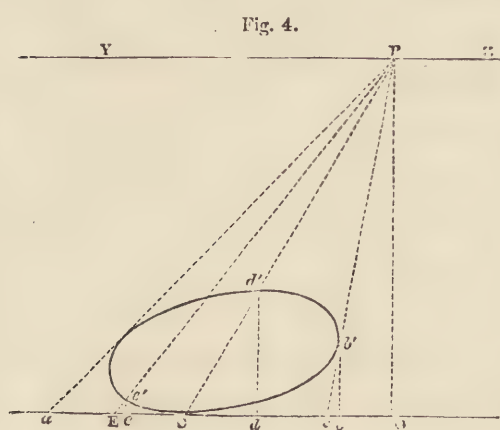
Fig. 4.

3. In a former chapter, the method of putting any rectilineal figure into perspective was shown, and by the method of points, as applied to the circle, any curvilineal figure may also be put into it; and as all figures on the same plane, no matter how irregular they may be, are bounded by straight lines or curves (or the figure may be called *mixtilineal*), it is evident that the methods for these two conjoined will be the mode of proceeding in general cases.

4. *To put a cone in perspective.*—Let A B C, fig. 5, be the plane of a cone three feet in diameter at base, and four feet high. Let F O be the section line, and E the point of view, eight feet from the cone; let D be the seat of the vertex; draw D F perpendicular, and draw the visual ray, E D.
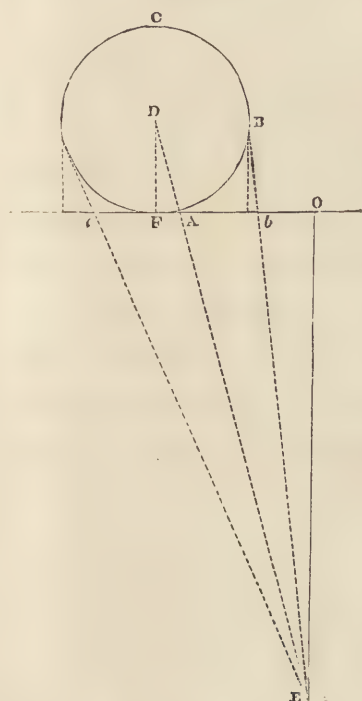
Fig. 5.

In fig. 6, let Y Z be the horizontal line, P the point of sight, and O F the base line; the base of the cone being a circle, it must therefore be first put into perspective. Make O F, O A, equal to O F, O A, in fig. 5, draw the perpendiculars F G, A D, and leave off the height of the cone on F G, four feet, and from this point draw a line to P; then where it cuts perpendicular from A in D, D will be the vertex; then draw tangents from D to the curve—they will form slant sides of the cone. Or if o e, o b, be made equal to o e, o b, in fig. 5, and perpendiculars drawn, they will touch the curve in two points, to which, if lines be drawn from D, they will form
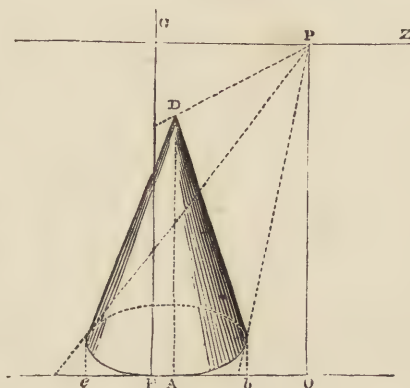
Fig. 6.

Fig. 7.
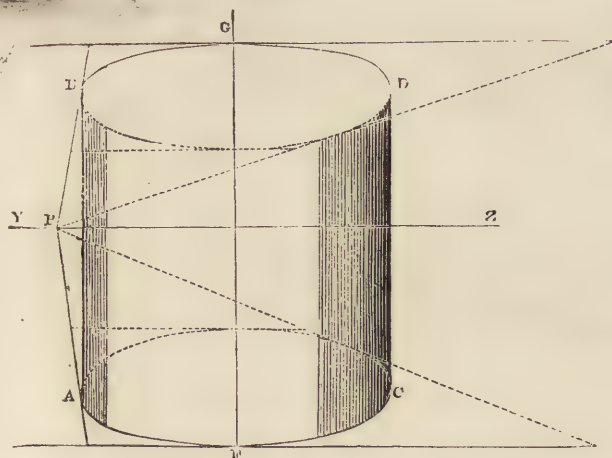
Fig. 8.
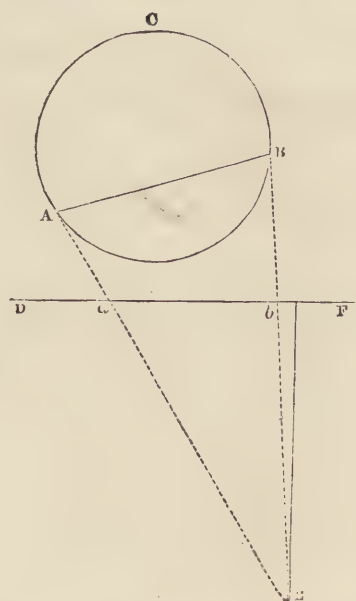
the slant sides of the cone. In fig. 5, e b is the representation of the apparent size of the diameter of the circle, found by drawing lines to represent visual rays to touch the circle.

5. *To put a cylinder in perspective.*—The top and bottom are equal circles; the bottom circle can first be put into perspective, and then the top one directly over it.

The plane of the picture touches the cylinder; F G is the line on which the height is laid off; Y Z is the horizontal line, and P the point of sight, as before. The two lines, A B and C D, may be made to touch the circles in A B, and C D; or these points may be found by the method shown in the last example.

6. *To put a globe in perspective.*—If the plane of the picture be perpendicular to the visual ray, passing to the centre of the sphere, the representation will be a circle; but if it be not perpendicular, the representation will be an ellipse. Let A B C be the plane of the sphere, E the point of view, and D F the section line. Now, if lines be drawn from E to touch the sphere in A and B, A B will be the apparent size of the diameter, and *a b* its representation. A section of the sphere through A B will be a small circle of the sphere, of which A B is the diameter; and all the visual rays from E to touch the sphere, will touch the circumference of this circle. The perspective of the globe will then be found by putting this circle into perspective by the method previously shown.

TABLE OF GEOMETRICAL FIGURES FOR PURPOSES OF GENERAL REFERENCE,

TO ILLUSTRATE THE TREATISE ON PRACTICAL GEOMETRY

LINES

STRAIGHT LINE — Shortest distance between two points.

CURVE LINE — Neither straight nor a zigzag, in direction continually varying.

HORIZONTAL LINE — A even line parallel to the horizon.

PERPENDICULAR LINE — Forming a right angle, or two right angles. It is not necessarily vertical, and if not so, the line with it is meets at right angles.

VERTICAL LINE — Perpendicular to the horizon.

PARALLEL LINES — In the same plane are equally distant from each other at every part.

ZIG-ZAG LINE — A series of straight Lines.

MIXED LINE — Composed of straight lines and curves.

A line which is not perpendicular to another is so, q.v.

ANGLES

ANGLES — The quantity of a surface of one line when they meet. The lines are the sides or legs of the angle; the point of meeting, the summit or the angle.

CURVILINEAR ANGLE — The angle formed by two curves lines meeting.

MIXTILINEAL ANGLE — Formed by a straight line and a curve line.

RIGHT ANGLE — The angle formed by one line erect, or being perpendicular the one to the other.

ACUTE ANGLE — Less than a right angle.

OBTUSE ANGLE — Greater than a right angle.

TRIANGLES

EQUILATERAL TRIANGLE — The three sides of which are equal.

ISOSCELES TRIANGLE — Two sides of which are equal.

SCALENE TRIANGLE — All the sides are unequal.

RIGHT-ANGLED TRIANGLE — Having one right angle.

ACUTE ANGLED TRIANGLE — Having its three angles acute.

OBTUSE ANGLED TRIANGLE — Having one obtuse angle.

QUADRILATERALS

SQUARE — Having four right angles, and four equal sides.

RECTANGLE — Having four right angles, and only the opposite sides equal.

DIAGONAL — Line joining the summits of two angles of a figure, not adjacent.

RHOMBUS, OR LOZENGE — Having its sides equal and two its opposite angles equal.

RHOMBOID — Has its sides parallel and only opposite sides equal.

TRAPEZIUM — Having no two sides of its sides parallel.

TRAPEZOID — Having two sides parallel.

RIGHT-ANGLED TRAPEZOID — Having two right angles.

ISOSCELES TRAPEZOID — Having two opposite sides equal.

REGULAR POLYGONS. Having equal sides and equal angles.

PENTAGON — Five sides and five angles equal.

HEXAGON — Six sides.

HEPTAGON — Seven sides.

OCTAGON — Eight sides.

NONAGON — Nine sides.

DECAGON — Ten sides.

UNDECAGON — Eleven sides.

DODECAGON — Twelve sides.

CIRCLES

CIRCUMFERENCE — A curve line of which the points are equally distant from a point or summit, termed the centre; the area bounded by the circumference.

DIAMETER — A line passing through the centre, and terminated each ways by the circumference.

RADIUS — A line drawn from the centre to the circumference; is half a diameter; all the radii are equal.

ARC — A part of a circumference.

CHORD — A right line joining the summits of an arc.

SEGMENT — Part of a circle cut off by a chord.

SECTOR — Space cut off by two radii.

INSCRIBED LINE — A line terminated both ways by the circumference.

INSCRIBED ANGLE — The summit at the circumference, and the sides consisting of two chords.

INSCRIBED TRIANGLE — The summits of the three angles at the circumference.

SECANT — Cutting the circle at two points.

TANGENT — Touching the circle without cutting it.

CONCENTRIC LINES — Having a common centre and parallel.

ECCENTRIC LINES — Having different centres.

ORDINATE — Joining a radius to the circumference.

ABSCISSA — The part of the radius lying between the circumference and the ordinate.

SPIRAL — Starting from a centre, and removing from it gradually.

HELIX — Turning on a cylinder and uniformly advancing lengthwise.

TANGENT CIRCLES

CIRCUMSCRIBED POLYGON

ELLIPSE

SOLIDS

TETRAHEDRON — Having the faces composed of four equilateral triangles.

HEXAHEDRON — Having six faces, equal squares.

OCTAHEDRON — Having eight faces, equal triangles.

DODECAHEDRON — Having twelve faces, equal pentagons.

ICOSAHEDRON — Having twenty faces, isosceles triangles.

TRIANGULAR PRISM — Having three sides in the base.

QUADRANGULAR PRISM — Having four sides in the base.

TRUNCATED PRISM — Having the plane of one end oblique to the sides.

HEXAGONAL PRISM — Having six equal sides in the base.

TRIANGULAR PYRAMID — Having a triangle in the base, and terminating in a point.

QUADRANGULAR PYRAMID — Having a square for the base.

HEXAGONAL PYRAMID — Having a hexagon for the base.

CYLINDER — Generated by the motion of a circle parallel to itself and at right angles to its own plane.

CONE — Having a circle for a base, and terminating by a point.

INCLINED PYRAMID

INCLINED CYLINDER

SPHERE — The outer surface of which is at all points equally distant from the centre.

SPHEROID — A flat sphere. Has an ellipse in side elevation.

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PRACTICAL GEOMETRY.

LET not the practical student be repelled from the study of this treatise, as if there were something unintelligible in the word GEOMETRY. A geometrical form is simply a regular form, or a form of which the development is founded on some definite rule—a geometrical rule or law. A piece of lump-sugar, casually broken from a larger mass of the same substance, or a clod of earth turned over by the plough, or the outline of the sea-coast, cannot be said to possess a geometrical form, in the ordinary sense of the phrase; because we followed no law of form in giving a separate existence to the former objects, nor can we recognise any regularity in the form of any one of the three. In each case, the form is rather a compound of a multitude of other forms equally irregular, thrown together in an irregular manner. In a more comprehensive sense, indeed, it may be affirmed, without contradiction, that the form of the clod, such as it is, has resulted from the recognised laws of gravity and cohesion, and must of course possess some definite relation of parts; but without being hypercritical, and raising any argument on this point, which is really beside the question, every intelligent artisan will understand the nature of the distinction, as regards form or outline, between *shapeless* masses of wood, iron, earth, or loaf-sugar, and the erect, square, and rounded mass of a steam cylinder, or the precise exactitude of a spur-wheel.

Again, to approach still nearer, by comparison, to the distinctive idea of geometrical forms, there are many forms which, while they are not geometrical, are nevertheless characterised by a simplicity, harmony, and grace, which set them at a wide distance from such rude forms as those we have been contemplating. We need only allude to the human form, as a pre-eminent example of the distinct class of forms now alluded to. The simplicity of the human form is greatly owing to its being composed solely of curve lines; now, not only are straight lines excluded from the figure, but circular lines also, at least so far as that they never constitute any feature in the outline. In tracing the contour of the body in any given attitude, or from any given point of view, we no sooner arrive at an elevation or a depression which begins to assume a circular outline, than it sweeps into another curve, either rounder or flatter than the one which precedes it, or of which the convergency may be reversed, so as to form an undulation. If we may be permitted to apply the language of geometry at all, we would say that the radius of curvature perpetually varies, and is frequently reversed; and that the utmost approximation to a geometrical analysis of the figure would be the remote generality, that it is composed of very short segments of circles, directly and reversely running into one another. That this definition is of no practical utility, however, is very evident from the fact, that no one ever yet could delineate the human form on geometrical principles, as we daresay no one ever attempted it. He who could seriously set himself to accomplish such an impossibility would be scouted, pitied, or laughed to scorn.

In the meantime, to cut short these preliminary remarks, we hope we have succeeded in assisting the student to understand what geometrical forms *are not*. It behoves us now to explain to him what geometry *is*, and to initiate him into such of the problems of geometry as are necessary for his aid in the practical delineation of his compositions. In approaching this introductory exposition, we mean to state and illustrate only such propositions as are of directly practical use in the delineation of all ordinary matters of design, to the exclusion of such as may safely be left to remain within the pasteboard walls of Euclid. We utter this apparently irreverent sentence—irreverent towards the memory of the immortal Euclid—with the proviso, that we speak of what is wanted only for the immediate necessities of the draughtsman—of what he cannot do without. We know from experience that many an artisan will consent to devote his attention to the acquisition of a few plain methods of doing a few plain things, when he would be effectually scared from the regular study of a system embracing the development of the principles of geometry. We heartily recommend the study of Euclid's Elements of Geometry to such as are able and willing to bestow upon it the leisure and application necessary for its prosecution, as they will thereby not only acquire a complete conception of the nature of the science, but will also provide themselves with a fund of general ideas on the relations of figure, which will, in many cases, be of very great advantage to them.

Geometry, then, is the science which treats of the properties and relations of *magnitudes*; that is, of things which have length, or length and breadth, or length, breadth, and thickness. The word is derived from two Greek words, signifying *the earth* and *measure*, obviously embodying the idea of measuring the earth. Some more specific explanations, however, are required; and we shall now explain what are the *things* referred to in the definition.

A *solid* is that which extends in three directions; that is, which has length, breadth, and thickness. The application of these distinctive terms to the three dimensions of a body is simply a matter of convenience. In applying the reasonings of geometry to a solid, it does not matter though the solid were turned upside down, or round about; whether its thickness or height should exchange its name for its length, or its length under one aspect should be called its breadth under another aspect.

A *surface* or *superficies* is that which has only length and breadth. It may be called the boundary of a solid, as it has no thickness.

A *line* has only length, without either breadth or thickness; and it may properly be distinguished as the boundary of a surface, the simple termination of it.

A *point* has neither length, breadth, nor thickness; it has simply position. For example, the intersection or crossing of two lines which pass through each other, is a point; it obviously has a position or locality, but cannot be said to have either length, breadth, or thickness. In like manner, the extremity of a line is a point; it terminates the line.

In attempting to represent lines and points on the surface of paper by means of drawing instruments, the representations can never more than approximate to the things intended to be shown. For the finest line that can be drawn will have *some* breadth; and, indeed, if it had no breadth, it could not be visible. In the same way, a point may be represented by a very minute dot or puncture on the surface; still, as it covers *some* surface, it is not a geometrical point; it is only an approximation, or something very near what is intended. Since, then, all material representations of objects on paper, by means of lines, are really only approximations in proportion to the fineness of the lines employed, those drawings will be the most correct in which the

finest lines are employed, other circumstances being the same. It should be understood, then, that the foregoing definitions are not without their practical value, as they set before the student the standard of perfection to which, if not really attainable, he should strive to approach as nearly as possible.

In studying the following definitions, the reader is requested to refer, where necessary, to the accompanying Table of Geometrical Figures for illustrations of the objects of the definitions.

A *straight line* is the shortest way between the points constituting its extremities. Straightness is exemplified in the strings of a violin when screwed up into a state of tension. If a straight line were bent at particular points in its length, it would become a *series* of straight lines, termed in familiar language a *zig-zag*.

A *curve line* is one which continually changes its direction between its extremities. It is evidently not the shortest way between its extremities; neither is it a zig-zag, as this is composed of straight lines.

A *plane surface*, or *plane* simply, is a surface which contains the smallest extent of surface that can be enclosed by its boundaries. This is exemplified in the end of a drum, which, when screwed up or stretched into musical trim, is perfectly *flat*, as we would say in ordinary language. And it is clear that the shortest distance between any two points on the surface of the drum-end, must lie in that surface; that is, in general, if any two points be taken in a plane, the straight line which joins them will lie wholly in that plane. For illustration of this, if we apply a "straight edge" to the stretched surface of the drum, we shall find that it coincides with that surface, into whatever direction it may be turned.

A *curve surface* is one which is continually deflected, no part of it being a plane. The shell of an egg presents a curve surface, whether it be viewed externally or internally. The exterior surface of the superficies is denominated a *convex* surface, and the interior a *concave* surface.

Parallel lines are straight lines in the same plane, which are equally distant from each other at every part. They, consequently, never can meet, though produced or extended ever so far either way.

A *rectilineal angle* is the quantity of divergence of two straight lines, which either meet or cut each other at a point, without regard to the lengths of the lines. As there are numberless positions in which the lines meeting or intersecting may be placed in relation to each other, so there may be numberless angles at which they may stand. These may be arranged into three classes—right angles, obtuse angles, and acute angles.

A *right angle* is formed by one line standing on another, so that the adjacent angles may be equal, *each* of these angles being a right angle. Thus the line, D B (fig. 1), standing on the line, A B C, forms with it the two angles at B; and if these angles be equal, then each is a right angle. Further, the line, D B, is called a *perpendicular* to the line, A C, in virtue of its right-angular position.

Fig. 1.
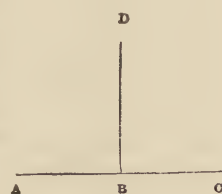
Here we may shortly explain, that, in designating an angle, we employ the letters used to denote its sides. Thus, the angle contained by the lines, A B and D B, is called the angle, A B D; and that contained by D B and B C is the angle, D B C.

An *obtuse angle* is one which is greater than a right angle. Thus, if the dot line, F I (fig. 2),

be at right angles to the line, E F G, the line, F H, inclining to one side of the perpendicular, F I, will form the obtuse angle, E F H.

An *acute angle* is one which is less than a right angle. Thus, the line, F H (fig. 2), inclining toward F G, off the perpendicular, forms the acute angle, H F G.

A *plane triangle* is a surface bounded by three straight lines. When three sides are all equal, it is termed *equilateral;* when two of them are equal, it is called *isosceles;* all other plane triangles are classed as *scalene* triangles. Any side may be called the *base.* Triangles are denominated also according to the magnitudes of their angles. When the three angles are acute, a triangle is called *acute-angled;* when one angle is obtuse, it is *obtuse-angled;* when one is a right angle, the triangle is named a *right-angled* triangle.

In a right-angled triangle, the side opposite the right angle is called the *hypothenuse;* the other sides are called, indiscriminately, one of them the *base,* and the other the *perpendicular.*

A *quadrilateral* figure is that which is bounded by four straight lines. When the opposite sides are parallel, it is called a *parallelogram.* When a parallelogram has right angles, it is called a *rectangle;* when a rectangle has all its sides equal, it is termed a *square;* when a parallelogram has no right angles, it is termed a *rhomboid;* when the four sides of a rhomboid are equal, it is termed a *rhombus* or *lozenge.*

A quadrilateral figure is termed a *trapezium,* when neither pair of its opposite sides are parallel. A trapezium with two sides parallel is called a *trapezoid.*

A *diagonal* is a straight line joining two angles of a figure, not adjacent.

Plane figures of more than four sides are called *polygons.* When the sides of a polygon are equal, it is a *regular* polygon; when they are unequal, it is *irregular.* The distinctive appellations of polygons, derived from the number of their sides, may be learned from the Table, under the head of REGULAR POLYGONS.

The *circle* is a plane figure, bounded by one curve line, called the *circumference,* and is such that the circumference is at all points equally distant from a point within it, called the *centre.* Thus the curve line, A E F, in the annexed figure (fig. 3), is the circumference; the area enclosed is the circle; the point O, from which lines, O A, O B, O E, drawn to the circumference, are all equal, is the centre. Any line, as O A, drawn to the circumference from the centre, is termed a *radius;* and a line, B O E, passing through the centre, and terminated both ways by the circumference, is called a *diameter.* The radius is, then, half the diameter.

An *arc* of a circle is any part of the circumference, as C F D.

A *chord* of a circle is a straight line joining any two points of the circumference, as C D, joining the points C and D.

A *sector* of a circle is the space cut off by two radii, as A O B, or A O E. When the radii are at right angles, the sector is called a *quadrant.*

A *segment* of a circle is the space cut off by a chord, as the space, C F D, cut off by chord, C D.

A *semicircle* is a portion of a circle cut off by a diameter, as the space, B F E, cut off by the diameter, B E. This space amounts to half the circle.

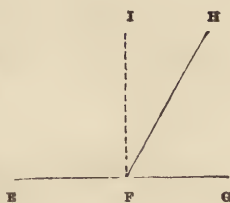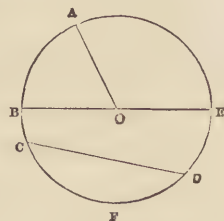A *tangent* to a circle is a straight line which touches it, meeting it only at one point, called the *point of contact.*

Of *solids* there are a great variety. As planes are bounded by lines, and derive their names from the character and dispositions of these lines; so solids are bounded by surfaces, either plane or curve, and derive their titles therefrom. Regular solids, bounded exclusively by planes, cannot have fewer than four sides. A four-sided solid is termed a *tetrahedron*. A solid having more than four sides is a *polyhedron*. The specific titles of polyhedrons will be learned from the Table, which see also for the definitions of *prism, pyramid,* &c.

If the student has taken the pains to understand the foregoing definitions, he will proceed with pleasure to the study of the following problems and their practical solution.

PROBLEM I. To bisect (or divide into two equal parts) a given straight line by a perpendicular drawn to it.

1. To bisect the given line, A B (fig. 4), set one foot of the compasses on the extremity, A, as a centre; and with any convenient radius that is evidently greater than half the line, describe the arc, c D; similarly, from the point, B, as a centre, describe another arc with the same radius, cutting the first one at the points, c and D.

Fig. 4.

2. Through the points of intersection, c and D, draw a straight line, c E D. This line will divide the given line, A B, into two equal parts, A E, E B, at the point, E; and will also be a perpendicular to the line.

It is not necessary, in practice, to draw the complete arcs, c D. An experienced eye can readily anticipate the points of intersection of the arcs, within small limits. Neither is it necessary to do more than apply a straight edge to these points of intersection, and tick the point, E: unless, indeed, the perpendicular itself be wanted, which is often the case.

The same process serves for the bisection of a circular arc; for, supposing A B to be the chord of the arc, the perpendicular which bisects the chord will also bisect the arc.
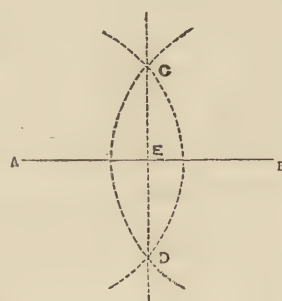
PROBLEM II. To draw a perpendicular to a given straight line, from a given point in that line.

First.— When the point is near the middle of the line.

1. Let A B (fig. 5) be the line, and c the point near the middle, from which the perpendicular is to be drawn. On c, as a centre, with any convenient radius, set off equal parts, c D and c E, on the line, A B.

Fig. 5.

2. On D and E, as centres, and with a longer radius, describe arcs intersecting at F, and, if wanted, on the other side of the line also.

3. Draw the line, F c. It will be a perpendicular to the line, A B, at the given point, c.
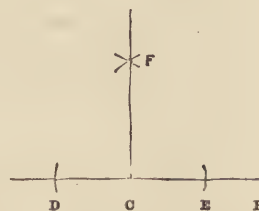
Second.—When the point is at or near one extremity of the line.

1. Take any convenient point, c (fig. 6), obviously within the perpendicular to be drawn from the given point, B; place one foot on c, and extending the other to B, describe a circle, A B D, cutting the line A B at A.

2. Set a straight edge to the points, A and c, and draw a line, cutting the circle at D.

Fig. 6.

3. Draw B D, which will be the perpendicular required.

Another Method.—1. From the given point, B, set off, on the given line,

b
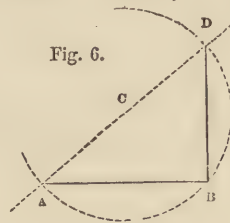
a distance such as B A, equal to three of any units of measure, as three inches, or three feet.

2. From B, as a centre, with a radius of four of the same parts, describe an arc, supposed to pass through D.

3. From A, as a centre, with a radius of five parts, describe an arc, cutting the other arc at D.

4. Draw D B for the perpendicular required.

This last method of solving the problem can be easily applied on a large scale for laying down perpendiculars on the ground. Timbers also may be set at right angles by the same method. The numbers three, four, and five, are, it is to be observed, taken to measure respectively the base, the perpendicular, and the hypothenuse, of the right-angled triangle, A B D. Any multiples of these numbers may be used with equal propriety, when convenient; as six, eight, and ten, or nine, twelve, and fifteen, whether inches, feet, or any other unit of length.

When a series of perpendiculars to the same straight line are required, they may, if not above six inches long or so, be drawn with ease by means of a straight edge and a triangle, after one of the perpendiculars has been found, by the foregoing method. Thus, one edge of the triangle, A B (fig. 7), being set to the perpendicular found, and the edge of the rule, C D, applied to the base, if the triangle be slid along the edge of the rule, its side, A B, will run parallel to the line to which it was set, and will consequently yield perpendiculars as far as the rule may extend.

A similar application of the triangle and straight edge enables us to draw parallels to any given line.
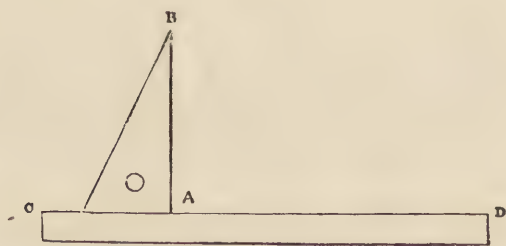
Fig. 7.   Fig. 8.
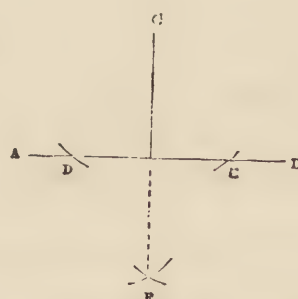
PROBLEM III. To draw a perpendicular to a given line from a given point without the line.

First.—When the point is conveniently near the middle of the line.

1. Let A B (fig. 8) be the line, and c the point without it. On c, as a centre, with a conveniently long radius, describe an arc, cutting the line, A B, at the points, D E.

2. On the points, D E, as centres, and with a longer radius (the longer the more accurate the work is likely to be), describe the arcs intersecting at F.

3. Set a straight edge to the points, c and F, and draw a straight line from c to the line, A B. This will be the perpendicular required.

If there be no room below the line, A B, the intersections, F, may be taken above, that is, between the point, c, and the line. This mode is not, however, so good as the one already described, because it is not likely to be so exact.

Second.—When the point is near the end of the line.

1. In the figure annexed to the second case of Prob. II. (fig. 6), let D be the given point, and A B the straight line. From D draw any straight line, D A, meeting A B at A.

2. Bisect A D at c, and on c, as a centre, with c A as a radius, describe an arc, cutting A B at B.

3. Draw D B for the perpendicular required.

PROBLEM IV. To describe a square on a given straight line.

Fig. 9.

1. Let A B (fig. 9) be the straight line, or the base of the proposed square. Draw A C and B D perpendicular to the base, from its extremities, and make each of them equal to A B.

2. Draw the line, C D; this will complete the square, A B C D, on the line, A B.

A rectangle may be constructed in the same manner. Having determined one of the sides, perpendiculars are drawn from each end of it, of the proper equal lengths, and their extremities joined.
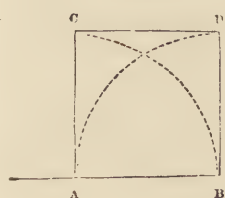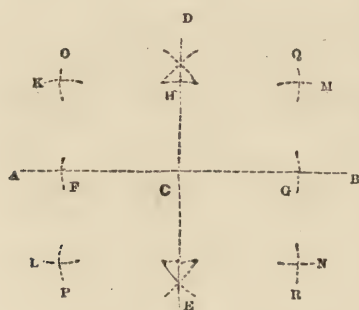
When the centre line of a rectangle is given, the figure may be very accurately described in the following manner :—

Fig. 10.

1. Let A B (fig. 10) be the centre line, and c the middle of the length of the figure. Draw the perpendicular, D E, through the point, c.

2. Set off c F and c G on each side, equal to half the length of the rectangle.

3. Set off c H and c I on the line, D E, each equal to half the breadth of the rectangle; with the same radius, and from the centres, F G, describe arcs, K, L, M, N.

4. From the intersections at H I, and with the half-length as radius, describe arcs, O, P, Q, R, cutting the others. The four lines joining the extreme points of intersection will constitute the rectangle.

PROBLEM V. To draw a line parallel to a given line.

First.—To draw the parallel at a given distance.

1. Let A B (fig. 11) be the given line. Open the legs of the compasses to the required dis-

Fig. 11.
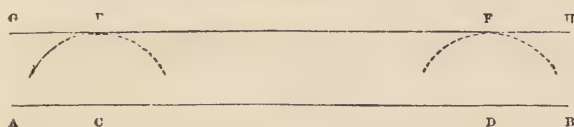
Fig. 12.
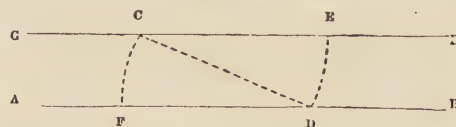
tance, and from any two points, c and d, (the farther apart the better,) describe two circular arcs on the side towards which the parallel is to be drawn.

2. Apply a straight edge tangentially to the arcs at E and F, and draw the straight line, G H; this will be a parallel to the given line.

Second.—To draw the parallel through a given point.

1. Let c (fig. 12) be the point; from c draw any oblique line, C D to A B.

2. From c and d, as centres, describe arcs, D E and C F.

3. Make D E equal to C F, and through the points, c, E, draw the parallel, G H. This is the line required.

The methods of describing squares and rectangles, already given, are also available for drawing parallels, though they are not so generally ready of application as the foregoing.

PROBLEM VI. To divide a straight line into any number of equal parts.

1. Let A B (fig. 13) be the straight line, to be divided into, say, five equal parts. Through

the points, A and B, draw two parallels, A C, B D,
forming any convenient angle with A B.

Fig. 13.

2. Take any convenient distance, and lay it off
four times (one less than the number of parts required)
along the lines, A C and B D, from the points, A and B
respectively; and join the first on A C to the fourth
on B D, the second on A C to the third on B D, and
so on. The lines so drawn will divide A B into the required number of equal parts.

With the assistance of the straight edge and the triangle, or a
couple of triangles, this process may be considerably expedited.
Thus, having drawn an oblique line, A C, from the point, A, lay off
five equal parts on it; set the edge of the triangle to the point, B,
and the fifth graduation on A C (fig. 14), slide the triangle parallel
to itself in the direction, B A, and draw parallels from the points of
division on A C to the line A B; the latter will thus be divided into
five equal parts.
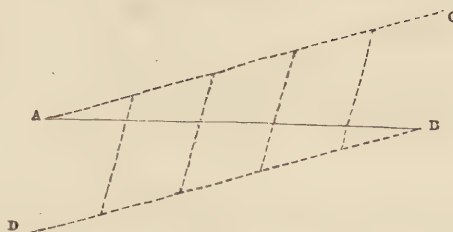
Fig. 14.
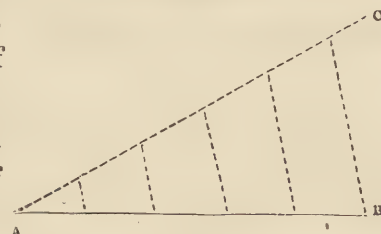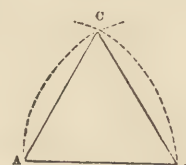
Fig. 15.

PROBLEM VII. To construct an equilateral triangle.

1. Let A B (fig. 15) be the length of the side of the triangle. On A and
B, as centres, describe arcs, cutting each other at c.

2. Join A c and B c; the triangle, A B c, thus formed, is equilateral.

PROBLEM VIII. To construct a triangle, having its three sides of given lengths.

1. Let A B (fig. 16) equal the base of the triangle. On A, as a centre, with a radius equal to
one of the sides, describe an arc.

2. On B, as a centre, with a radius equal to the third side, describe an arc, cutting the former at c.

3. Join A c and B c. The triangle is thus completed as required.

This problem is useful in enabling us to locate a point, the distance of which from two other
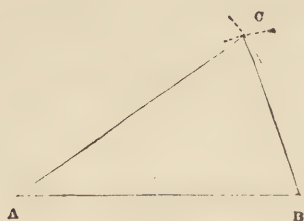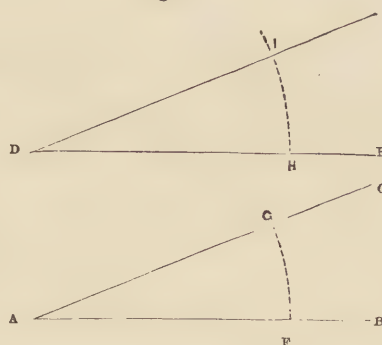
Fig. 16.   Fig. 17.   Fig. 18.
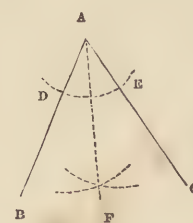
points is known. Thus, the position of the point, c, is readily ascertained by the foregoing process,
when its distances from the points A and B are given.

PROBLEM IX. To draw a straight line so as to form any required angle with another straight
line.

1. Let B A C (fig. 17) be the given angle, and D E the line upon which an equal angle is to

be drawn at the point, D.   From the points A and D, with any convenient radius, describe arcs F G and H I.

2. Set off the length of the arc F G, contained between the lines A B and A C, upon the arc H I; and draw D I.   The angle, E D I, will be equal to the given angle, B A C.

PROBLEM X. To bisect a given angle.

1. Let B A C (fig. 18) be the given angle.   On A, as a centre, describe an arc, cutting the sides of the angle at D and E.

2. On D and E, as centres, describe arcs, cutting each other at F.   The line A F will bisect the angle, as required.

PROBLEM XI.—To find the centre of a circle, or of a segment of a circle.

First.—For the centre of a circle.

Fig. 19.
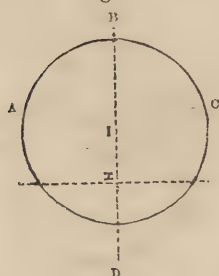
1. Let A B C D (fig. 19) be a circle, of which the centre is to be found. Draw any chord A C.

2. Bisect the chord at E, and draw B D perpendicular to it, bounded both ways by the circumference.   Then B D is a diameter.

3. Bisect B D at F; this point will be the centre of the circle.

Or the following method may be adopted; and it is the more expeditious of the two.

1. From any point, B, in the circumference, with a radius not greater than that of the circle, describe a circular arc.


Fig. 20.
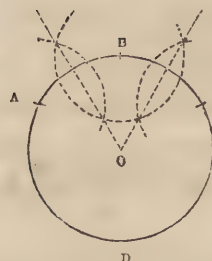
2. From two other points, A and c (fig. 20), beyond this arc, one on each side, describe other arcs with the same radius, each cutting the first arc in two points.

3. Through the two points of intersection thus found, draw straight lines meeting at the point o.   This will be the centre of the circle.

Second.—For the centre of a circular segment or arc.   The second process for finding the centre of a circle may also be applied to find the centre of a segment.   In the diagram annexed to the description of that process, if the segment, A B C, be given, its extremities, A and C, and any intermediate point, B, may be taken for the centres on which the curves are described, and the centre, o, will be found, as already explained.   If the curve be greater than a semicircle, as A D C, the same process is applicable; or if it be much greater, the first method may be resorted to.   It is obviously of importance that the points, A, B, and C, be well apart, and about equally distant too, and also that the arcs employed be of as large a radius as convenient, as the process is then likely to be more accurate.

Fig. 21.
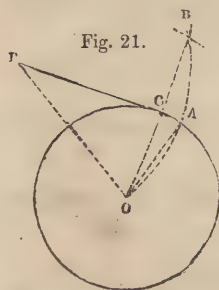
PROBLEM XII.—To draw a tangent to a circle through a given point.
There are several varieties of this problem, depending upon the position of the given point, and the accessibility of the centre.

First.—When the point is outside the circumference, and the centre given.

1. Let P (fig. 21) be the point, and o the centre of the circle, A.   With the radius, P o, on the centre, P, describe the arc, o A B.

c

2. With the diameter of the given circle, as radius, on the centre, o, cut the arc at B; join O B, and bisect it at c. The line, P C A, will be a tangent to the circle, touching it at A. Here it may be observed, that as the line, P C A, is perpendicular to O B, it is identical with the line employed in the process for bisecting the line, O B; thus there may be but one operation in performing this bisection, and drawing the line, P A.

The tangent may be drawn in the following manner also. Draw B O to the centre; upon P O as a diameter describe a semicircle, cutting the circle in A; the line P A is the tangent.

Second. When the given point is in the circumference, and the centre given.

1. Let A (fig. 22) be the given point. Draw O A D, making A D equal to O A; and draw B A C perpendicular to it, and B A is the tangent required.

Third. When the centre is inaccessible, as the given point is in the circumference.

1. Let A B C (fig. 23) be the given arc, and A the given point. Set off from A two equal arcs, A B, B C, and draw the straight lines, A B and A C.

2. Make the angle B A D equal to the angle B A C. Then A D is the tangent.

Fig. 22.   Fig. 23.

This is a very simple operation, and it may be employed with advantage even though the centre be given.

Another mode is to set off on each side of the point A, equal arcs A B and A E; to join E B, and to draw a perpendicular, A F, to it, and finally to draw A B perpendicular to A F.
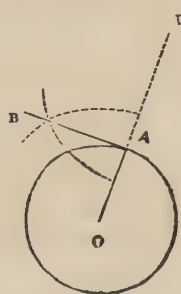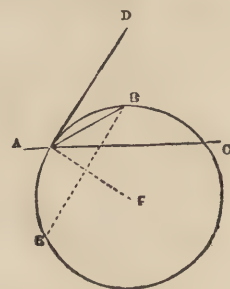
PROBLEM XIII.—To describe a circle that shall pass through three given points.

The second process for finding the centre of a circle (Prob. XI.) is exactly applicable for this purpose. Referring to the accompanying figure, suppose A, B, and C, to be the three given points; the point O being found by the method there delineated, it is the centre of the circle required, and by taking the distance to any of the points A, B, C, as a radius, the circle may be described passing through all the three points.

Also this problem is obviously identical with that which requires to circumscribe a triangle, as in this case a circle is to be described passing through the three points terminating its angles; the problem which proposes to describe an arc of a circle passing through the extremities of a straight line with a given *rise*, is but another form of the one now discussed. For example, in the figure accompanying the first process under Problem XI., if A B be the straight line, and E B the given rise, being a perpendicular to it at the middle point E, it is clearly a case of the 12th problem; as we have the three points, A, B, C, and we wish to describe an arc passing through these three points. This problem will be useful for finding the diameter of any large object, when only a part of the circumference is accessible.

PROBLEM XIV. To draw a number of radial lines upon the circumference of a circle, the centre being inaccessible.

1. If the radii are at equal distances, divide the circumference, or a part of it, into the required number of equal parts, at the points A, B, C, &c.

2. On the points A, B, C, &c., as centres, with radii larger than a division, describe

arcs cutting each other at *b, c*, &c.; thus, from A and C, as centres, describe arcs intersecting at *b*; and from B and D, as centres, describe arcs cutting *a, c*; and so on. The lines, A B *b*, C *c*, &c., will be radial lines, as desired.
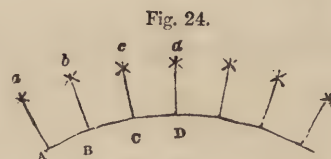
Fig. 24.

In presenting the foregoing methods of performing geometrical operations, no account is taken of the use that might be made of the common T square, and the triangles, or of the parallel ruler. These instruments will, however, where applicable, assist considerably on many occasions, in simplifying the solution of the problems, and with an accuracy generally quite sufficient for practical purposes. When, for example, a tangent is to be drawn to a circle through a given point in the circumference, one edge of the triangle might be set to the radius at that point, and the parallel ruler set to the perpendicular edge of the triangle, and then shifted to the circumference, where the tangent could be drawn, or, if the tangent be parallel to an edge of the board, the T square will suffice to draw it.

PROBLEM XV. On a given line to describe a regular pentagon.

Let A B (fig. 25) be the given line, bisect A B at C, and draw C F perpendicular to A B. Set off on this line, a length, C D, equal to A B, the given side of the required pentagon. Draw A D, and produce it indefinitely, make D E equal to half A B. From A, as a centre, with the length A E, as a radius, describe the arc E F, cutting C F in F.

Fig. 25.
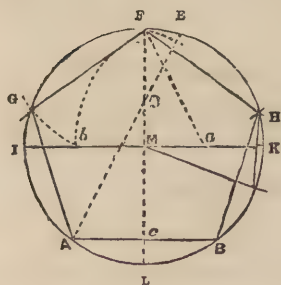
2. From A F and B as centres, with A B as a radius, describe arcs cutting each other in A and H.

3. Draw the lines A F and H B, when A G F H B will be the pentagon required.

PROBLEM XVI. To describe a pentagon in a given circle. Let A G F H B (fig. 25) be the given circle.

1. Draw the diameters, I K and L F, perpendicular to each other; bisect M K in *a*. Upon *a*, as a centre, with the distance *a* F, describe the arc F *b*. Upon F, as a centre, with the distance F *b*, describe the arc *b* G, cutting the circle at G. Join G A, and carry it round the circle five times, and it will produce the required pentagon. The arcs contained between the extremities of any side of the pentagon, as H K, being bisected as at H K, will give the side of a decagon, or ten-sided figure, inscribed in the same circle.

PROBLEM XVII. To construct a hexagon on a given line.
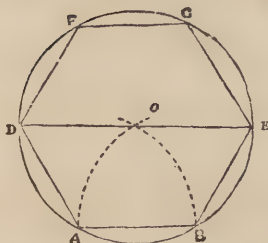
1. Let A B (fig. 26) be the given line. On the extremities of this line, with the extent of the line as a radius, describe arcs intersecting each other at C.

Fig. 26.

2. On C, as a centre, with the same radius, describe a circle. From the intersections at D and E, with the arcs before described, set off D F and E G on the circle.

3. Join A D, D F, F G, and E B, which will form the hexagon required.

When the circumscribing circle is given, the following method may be adopted.

Take the radius of the given circle in the compasses, and apply it to the circumference, which will divide it into six equal parts. Draw a chord to each arc, and the six chords will form the hexagon required.

PROBLEM XVIII. To inscribe a regular octagon in a given square.

Fig. 27.

Let A B C D (fig. 27) be the given square. Draw the diagonals, A D and B C, intersecting at E.

Upon A B C D as centres, with a radius E C, describe the arcs, H E L, K E N, M E G, and F E I. Join K G, H I, M N, and F L, and the required octagon is produced.

If a circle is given, in which to inscribe a regular octagon, it may be done in the following simple manner.

1. Draw two diameters at right angles to each other.

2. Bisect the four arcs thus obtained, and draw chords to each; which chords shall form the octagon required.

PROBLEM XIX. To describe any regular polygon upon a given line.

Let A B (fig 28) be the given line. Produce A B any length in either direction, as A C. From A as a centre, with A D as a radius, describe a semicircle, divide it into as many equal parts as the polygon is to have sides; in the present instance we have chosen five, as a D b c, the number of points required to produce a pentagon.

2. Draw lines through all the divisions (minus one), as A D, A b E, A c F.

3. From D and B as centres, with A B as a radius, describe arcs, cutting A E in E, and A F in F. Draw the lines D E, E F, and F B; when A D E F B shall be the polygon required.

Fig. 28.   Fig. 29.

PROBLEM XX. To describe any regular polygon in a given circle.

1. Let A F B D (fig. 29) be the given circle. Draw the diameter, A B. From E, as a centre, erect the perpendicular, E F C, cutting the circle at F. Divide E F into four equal parts, and set off three similar divisions from F to C.

2. Divide the diameter, A B, into as many equal parts as the polygon is required to have sides.

3. From C, through the second division in the diameter, draw the line C D, and A D shall be the side of the polygon required.

In each of these examples we have shown a pentagon, on account of its simplicity, but the same rule is applicable to polygons of any number of sides.
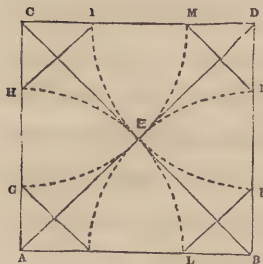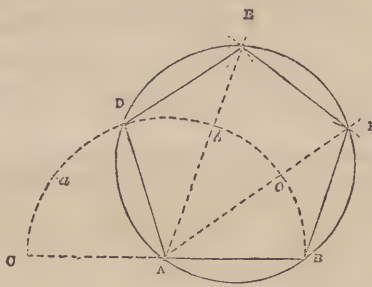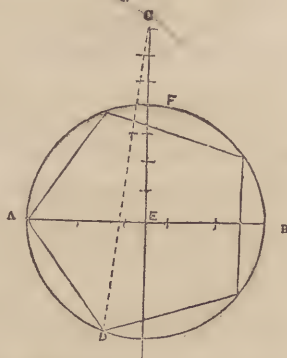
THE ELLIPSE.

The fact of circular surfaces changing their appearance with the different positions of the observer's eye, is so well known as to render any observations on that head needless; but in order to delineate them under all circumstances, it is essentially requisite that the student should understand that the elliptical curve thus assumed by the circular one is strictly regular, and is to be produced by rules as fixed and certain, as that by which we describe the circle itself. With the assistance of the annexed figure (30), which we have selected as a familiar explanation of the principles of the ellipse, the student will have no difficulty in understanding the plain definition of it. The line A B, passing through the length of the figure, is called its *transverse axis.*

Fig. 30.

The point G, which bisects the transverse axis, is the *centre* of the ellipse. The line C D, crossing this centre at right angles to the transverse axis, is termed the *conjugate axis.*

The point F in the transverse axis, and corresponding point H at the same distance from the centre on the other side, are called the *foci* of the ellipse.

A right line *f f* or *e e* passing through a focus of the figure at right angles to the transverse axis, and terminated at either end by a curve, is called the *latus rectum,* or sometimes the *parameter.*

A straight line passing in any direction through the centre of the figure, and terminated at either end by the curve, as *g g* or *h h,* is called a *diameter.*

A line drawn through any diameter parallel to a tangent at the extremity of that diameter terminated by a curve, is called a *double ordinate.*

The ellipse is constructed by the motion of a point about the centre of the figure G, beginning its course at the extremity of a diameter, as at A, and taking such a path as that its distance from one of the foci, together with its distance from the other, shall be, in every point throughout its course, exactly equal to the whole length of the transverse axis, A B. A practical application of this principle is to be found in the following method, which is often resorted to in the workshop for producing an ellipse. In the preceding figure, if the transverse and conjugate axes are given, the *foci* are determined by taking half the tranverse axis, as A G, and with that extent in the compasses, and on the extremity C of the conjugate as a centre, describing an arc, which cuts A B in the points F and H, which are the *foci.*

If pins are fixed in these points, and a thread equal in length to the transverse axis is fastened

d

to them by its extremities, a pencil so applied to the thread as to keep it continually stretched, or forming two straight lines, will, if progressively moved about the centre, describe the ellipse. Thus, in the figure before us, H C F may be supposed to be the thread, which, if gradually moved round the centre, will, at different points of its travel, take the position of the inclined lines H and E F, describing by the entire revolution of the pencil the ellipse, A C B D.

PROBLEM XXI. The transverse and conjugate diameters of an ellipse being given, as A B and C D, to describe the curve itself through a number of points, to be determined at the extremities of any number of diameters at pleasure.

Fig. 31.

1. Through the extremity, D (fig. 31), of the conjugate axis, draw E F parallel to the transverse axis; extend the line C D to G, and make it equal to A s or s B, half the transverse axis.

2. Upon G, with the radius G D, describe the circle, H D K; through the centre, s, draw the lines, s, L, E, s, M, r, &c. at pleasure, respectively cutting the line E F at E r, &c. Join the points thus determined on the line E F with the centre G, and mark the points of intersection produced on the arc, H D K, at l, m, n, o, &c.; draw lines from H, l, m, &c., parallel to G D, until they respectively intersect the extremities of the diameter at A, L, M, N, &c.; these points will be in the periphery of the ellipse, and a curve traced through them will describe the figure.

A figure which is often substituted for the ellipse for practical purposes, but is decidedly inferior to it in point of regularity and beauty of contour, may be drawn by means of circles in the following manner :—

Fig. 32.

1. Let A B (fig. 32) be a given transverse diameter; divide A B into three equal parts, by the points o v. From o and v as centres, with o A or v B as a radius, describe equal circles, D V F and E G O, cutting each other in the points I and K.

2. Draw the lines K O D, I V G, I O F, and K V E, cutting the circles in the points D E F and G.

3. From I and K as centres, with K D or I G as a radius, describe the curvilineal tangents, D E and F G, when the figure, A D, E B, G F, will be the ellipse required.

There are various methods of describing ellipses *mechanically* at present in use, probably the best of which is that invented by Mr. Ridley. By this instrument every species of ellipse, from a circle down to a right line, may be correctly formed.

The instrument consists mainly of a beam, *a*, carrying three sliding sockets, *b c d* (fig. 33), which may be set at any distance from each other. On the sockets, *b* and *d*, small sheaves are fitted to revolve on pins, and the centre one, *c*, is fitted to receive a pencil or tracer.

To explain the action of this apparatus, we shall suppose A B to be the transverse, and C D the conjugate axis of the required ellipse, intersecting each other at E. The inner edge of a square, F, is now to be applied to the lines, C, E, B, at such a parallel distance therefrom as to allow the

centres of the sheaves on the sliding bar to move exactly over the centre of the lines constituting the axes of the ellipse. To adjust the position of the sockets to produce the given ellipse, the distance between the pencil and the sheave, *b*, is made equal to half the length of the transverse axis, and *c d* equal to half the conjugate. If now the bar is moved along the edge of the square, as shown by the dotted lines, the tracing point will describe one quarter of the ellipse, each of the remaining portions being described in a similar manner.

This simple apparatus has since been considerably improved; instead of the plain square of wood, two grooved pieces of metal crossing each other at right angles, so as to form four squares, are substituted. The pins in the pencil beam are fitted to slide in the grooves which are made along the upper side of the squares. In this manner, the whole of the ellipse may be described at once, with the exception of the slight portion which the thickness of the square covers; these are easily filled in by hand.

Fig. 33.
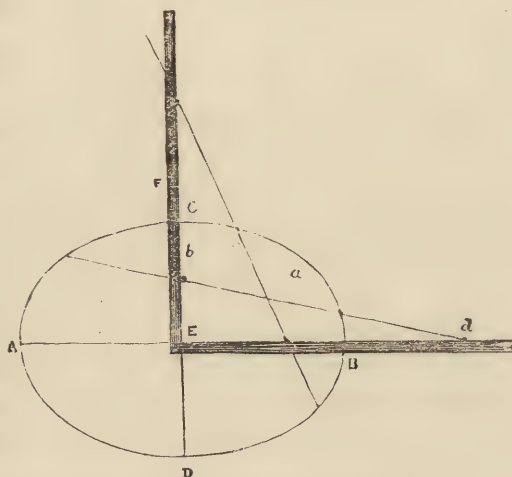
We now come to the consideration of the two curvilineal figures, the parabola and hyperbola, which, together with the ellipse, are generally treated under the head of Conic Sections, that is, as curves produced by the intersection of a flat surface with the curve surface of a cone.

Let A B C (fig. 34) represent a vertical section through the centre of a cone, the figure which is produced is a triangle.

If the entire cone is cut by a plane passing through it in the direction of D E, parallel to the base, the figure produced will be similar to the base, that is, a circle.

Fig. 34.

If the section is made in the direction F K, parallel with the opposite sloping side of the cone, as A B, the curve described on the surface will be a parabola. If the intersecting plane pass through the cone in the direction F I, perpendicular to the base and parallel to the axis, the curve produced on the surface of the cone by the section is an hyperbola.

If the intersecting plane pass through the cone in any oblique direction, as K L, the curve described on its surface will be an ellipse. As we have already explained the construction of the ellipse, we shall now proceed to examine that of the parabola.
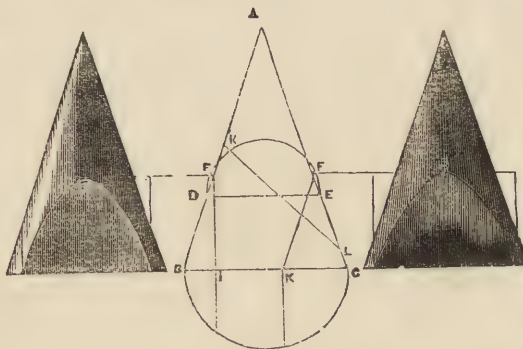
THE PARABOLA.

In order to enter fully upon the geometrical construction of this figure, we shall, in the first place, exhibit its mechanical formation, so as to enable us to set before the student the most explicit rules for application in practice.

In the annexed figure (35), let A B C be a straight-edged ruler, and A B D a common joiner's square; and let a thread of a length equal to B D be fixed by one extremity to the end of the square D, and the other to any point E, between the two rulers. If now the side A B of the square be moved along the edge of the ruler, A B C, and a pencil is applied to the edge B D, so as always to keep the thread stretched, at the same time that it allows it to slip round its point F, the pencil will describe a curve, F L H I, which is a parabola.

The point E, about which the thread moves, is called the *directrix*.

A line H K, drawn through the focus E, and perpendicular to the directrix, is called the *axis* of the figure.

The point H, in which the axis cuts the curve, is called the *vertex* of the figure.

A line G N, passing through the focus E, at right angles to the axis, and terminated by the curve, is the *parameter*.

Any line which can be drawn within the limits of the curve, parallel to the axis, as J K, is called a *diameter*.

If a tangent were drawn to J K at J, the extremity of the diameter, a line L O, drawn parallel to it, is called a *double ordinate*.

That part of any diameter which is contained within any part of the curve itself and its ordinate, as J K, is termed an *abscissa*.
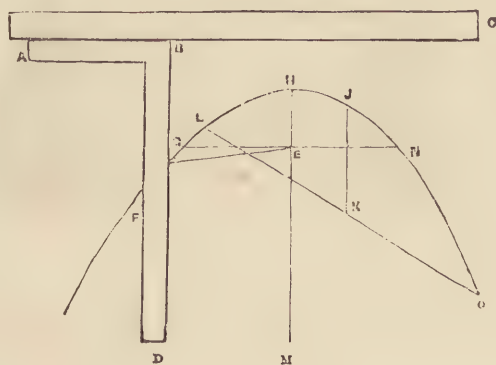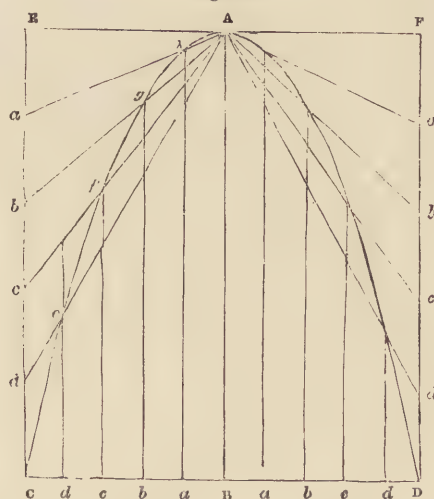
Fig. 35.

Fig. 36.

PROBLEM XXII. Let A B (fig. 36) be the given axis of a parabola, and C D a double ordinate. It is required to delineate the curve by a process which shall determine a number of points in its course.

1. Through A draw E F, parallel to the double ordinate, C D. Through C and D draw the perpendiculars, C E and E F, parallel to A B.

2. Divide B C and B D into any number of equal parts, as five. Likewise divide C E and D F in a similar manner.

3. Through the points *a b c* and *d* in C D, on each side of the point B, draw the perpendiculars *a e b f c g d h*, &c., and through the points *a b c* and *d*, in C E and D F, draw lines to the upper extremity A, of the transverse axis A B, respectively, cutting the perpendiculars drawn from the line C D, in the points *e f g h*, then will the points of intersection to the right and left of the transverse axis be situated in the curve of the required parabola, and which will be completed by tracing a line steadily through them.

THE HYPERBOLA.

In giving a familiar explanation of the properties of this curve, we shall again have recourse to the mechanical process of its formation, to the end that we may the more easily define its leading characteristics.

Referring to the accompanying woodcut (fig. 37), we shall suppose the points B and c to be determined, and a straight ruler, A B, to be made moveable on one of its extremities, about the point B, as a centre. To the end A of this ruler, one end of a thread is attached, the other being fixed at the determined point c. Now, let a pencil be applied to the thread, so as to press a portion of it against the edge of the ruler, as A D, and keep the other portion, D C, tightly stretched. The ruler being made to traverse on the given point B, at the same time that the pencil D moves along its edge, always preserving the tension of the threads; and the motion of the pencil or point D, will be in the curve D F G, which is that of an hyperbola.

If the extremity of the ruler, which now moves on the point B as a centre, was removed to c, and there made to traverse in a similar manner, the end of the thread now set at c, being now placed at B, the curve described would be an *opposite hyperbola*.

The points B and c, on which the ruler traverses, are called the *foci*.

A line terminated by the curves of the hyperbola and its opposite, and which, if continued at either extreme, would pass through either of the foci, as I H in the figure, is called the *transverse axis*. A line passing through the centre M of the figure to the right and left of it, and

Fig. 37.

terminated by the intersection of the arc of a circle, which is described on the point H as a centre, with the distance C M as a radius, is called the *conjugate axis*. Any line, as V W, drawn through the centre M, is called a *diameter*. If a tangent, with either of the curves, be drawn to the extremity of V W, another line, as F F, drawn parallel to that tangent, and through the centre M, is called a *conjugate diameter* to that at the extremity of which the tangent was drawn. A line drawn through any diameter parallel to its conjugate diameter, and terminated by the curve, is called a *double ordinate*. If any diameter be continued within the curve, and is terminated by the curve and a double ordinate, the part within is termed an *abscissa*. A line drawn through the focus of the figure, and at right angles to the transverse axis, is called the *parameter*.

e
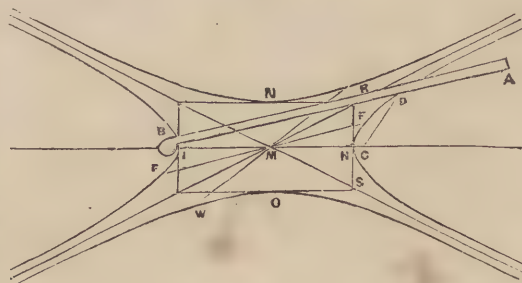
If through the extremity of the transverse axis, I H, a line, R S, is drawn parallel to the conjugate axis, N O, and equal to N O, having H R and H L respectively equal to M N and M O, their right lines drawn through the centre M, and the points R and S, as are the lines M X and M Y, are called *asymptotes*.

When the transverse and conjugate diameters are equal, the hyperbola is termed *equilateral* or *right-angled*.

The recapitulation of these dry and uninteresting terms may appear formidable to the student, but he must bear in mind that a complete knowledge of these is essentially necessary to enable him to comprehend and construct any hyperbolic curves with which he may meet in practice. For curves of a large size, the foregoing mechanical system of construction is very useful and accurate ; but, as before adverted to, in order to attain a complete knowledge of the subject, as well as to be able to cope with the different forms which occur, it is necessary to understand correctly their geometrical construction.

Fig. 38.

PROBLEM XXIII. The diameter of an hyperbola, A B (fig. 38), its abscissa, B C, and double ordinate, D E, being given, it is required to delineate the curve by determining a certain number of points which shall be in its course.

1. Through B draw G F parallel to D E, and from the extremities, D and E, of the ordinates, draw D G and E F parallel to the abscissa, B C, cutting G F in the points F and G.

2. Divide C D and C E, each into any number of equal parts, as four ; and through the points of division, *a b c*, on each side of the point C, draw lines to A.

3. Divide D G and E F into the same number of equal parts, and from the points of division on D G and E F, draw lines to B. A curve drawn through the intersections at *a b c*, on each side the diameter, will be that of the hyperbola required.
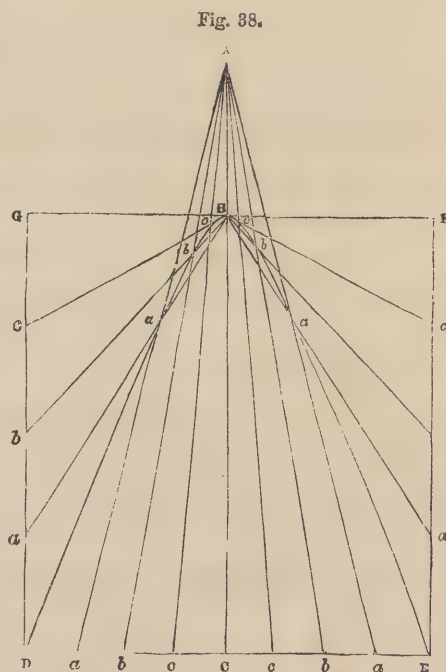
PROBLEM XXIV. The transverse and conjugate diameters, A B and C D (fig. 39), being given, it is required to determine a certain number of points in the curve with a view to its delineation.
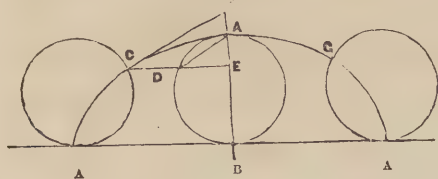
Through the extremity B, of the diameter A B, draw F G parallel to C D, the other diameter ;

Fig. 39.

and make B F and B G equal to the semi-diameters E C or E D. Through the points F and G thus determined, draw E H and E J, which will be the symptotes of the figure.
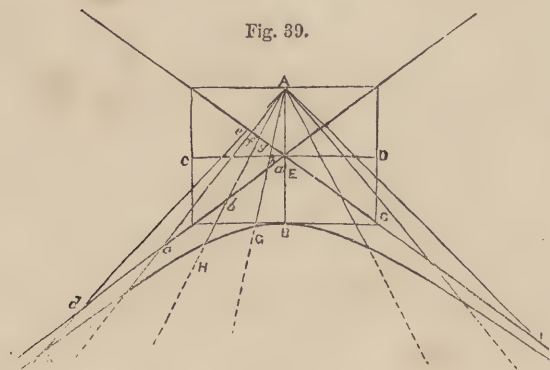
From A, as before, draw lines at pleasure towards the curve to be described, as A G, A H, A J, A K, cutting the asymptotes at the points *a b c d*, and *e f g*, and *h*, &c. Set off the distances A *h*, H *g*, A*f*, A *e*, respectively, from the points *a b c* and *d* on the lines from A ; and the points G H, J K, will be in the curve required.

If the student has gone over this course of practice in the construction of geometrical curves, by performing the examples themselves on a large scale, he will be enabled, in his future operations, to make use of them in any drawings which come before him in his every-day practice. There are numerous other useful curve lines which admit of regular definitions, as the Cycloid, Epicycloid, &c. The first of these curves, the Cycloid (fig. 40), may be defined in a familiar manner, by supposing it to be the periphery of a cart-wheel rolling along a level road. Thus the circle A B, in the annexed woodcut, may be supposed to represent the cart-wheel rolling in the direction A B A, and A to be the given point in its periphery. Under these conditions, the track of the point A during one revolution will be indicated by the curve line, A C A, G A, which is termed the cycloidal curve. The properties of the cycloid may be briefly defined as follows:— If the generating circle is placed in the centre of the curve, its diameter coinciding with the axis, A B, and if from any point there be drawn a tangent, C E, the ordinate, C D E, perpendicular to the axis, and the chord of the circle, then

Fig. 40.

The right line, C D, = the circular arc, A D.
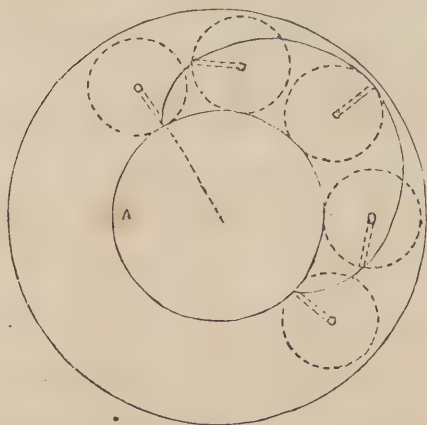
The cycloidal arc, A C, = double the chord, A D.

The semi-cycloid, A C A, = double the diameter, A B, and

The tangent, C F, is parallel to the chord, A D.

If the ball of a pendulum is caused to move in a cycloidal curve, its vibrations will be isochronous; that is, they will all be performed in precisely the same amount of time.
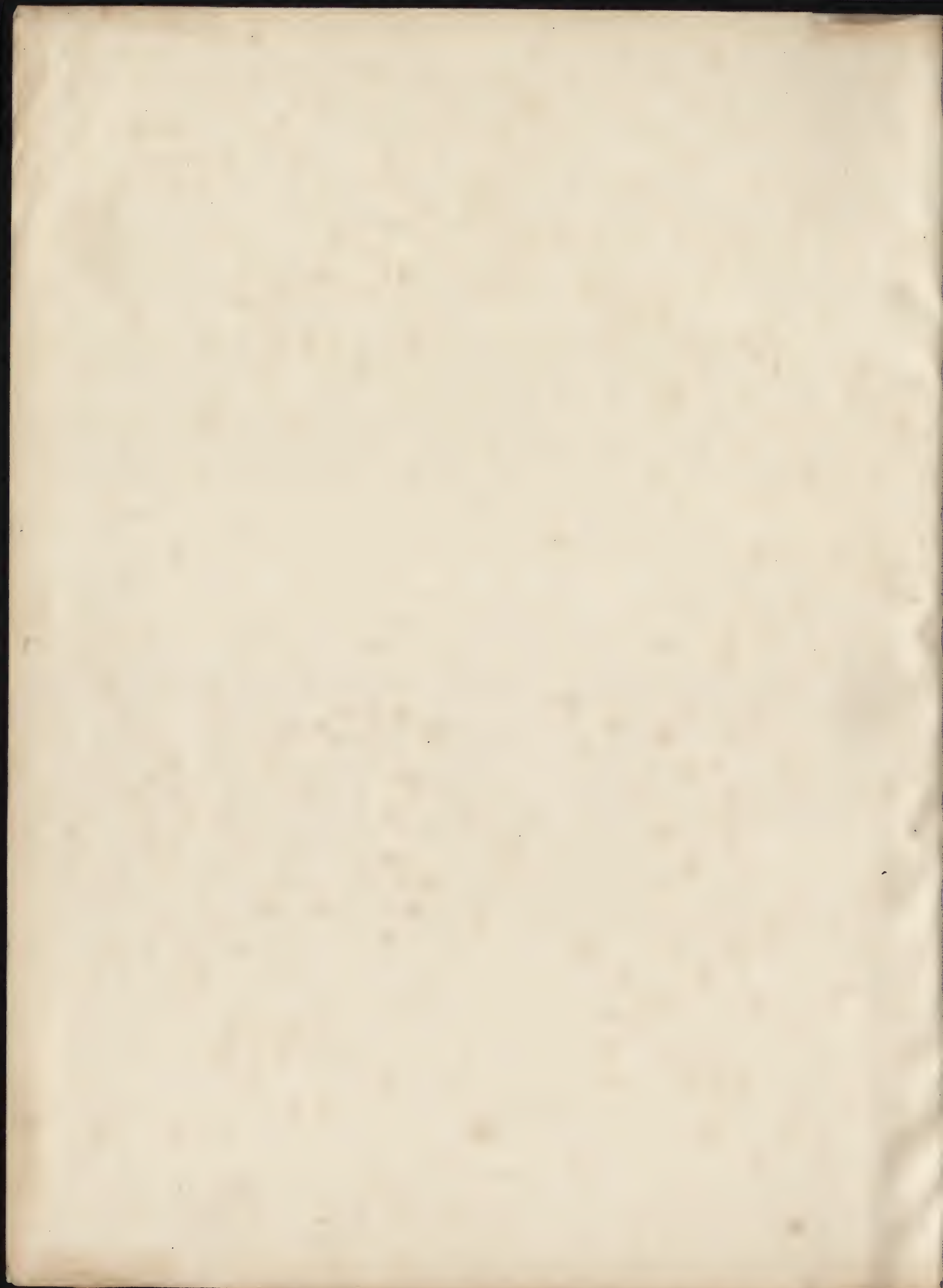
Fig. 41.

The epicycloid (fig. 41) differs from the cycloid in this, that it is generated by a point in one circle rolling upon the circumference of another, instead of a level surface. The cycloid may, however, be brought under the same definition, by regarding the straight line as the circumference of a circle whose diameter is infinitely great.

This definition of the curve will be understood by reference to the accompanying figure, in which A is the *generating* or rolling circle, and B the *fundamental* one, or that upon which it rolls in describing the exterior epicycloidal curve, C D. If the generating circle, instead of rolling on the outside, were to roll within the interior circle, a point in the former would describe an interior epicycloid, or, as it is more recently termed, the hypocycloid.